

ROADS AND STREETS

FEBRUARY 1947

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We Have
The BIT



Get them together and you will have the formula for greatly reduced drilling costs. It doesn't matter what kind of rock it is; there's a Timken Rock Bit to match and master it.

What makes the Timken Bit the superior rock drilling tool it is? (1) a detachable principle that has proved its correctness by more than 14 years service under all rock drilling conditions in mines and construction work. (2) Timken Steel developed especially for Timken Rock Bits and produced in our own steel plant. (3) Timken metallurgical "know how" in heat treatment and hardening. (4) uniform quality and performance; every Timken Bit will give the same outstanding service in speed of penetration and depth drilled when used in the same kind of rock.

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Adams

Motor Graders

Elevating

Graders

Leaning Wheel Graders

Widening the World's Busiest Highway



Bethlehem Bar Mats awaiting placement. Though less than a mile in length, this job called for approximately 52,000 sq yd of mats.



Showing ease with which two men can handle Bethlehem Bar Mats. Note heavy vehicular traffic along original highway at right.

There's good reason for widening the world's busiest highway—New Jersey's Route 25, in the vicinity of Newark Airport—from four to eight lanes. Originally designed to whisk cars to and from New York at the rate of 36,000 per day, this all-important traffic route has long been carrying an average of 60,000 cars daily, with occasional 24-hour holiday traffic topping the 100,000 mark.

These pictures were taken recently along the 0.85 mile Section 32A, one of two sections built for the New Jersey State Highway Department by Robert W. Cleveland Company, East Orange, N. J. Bar mats, dowels and cable guard rail were supplied by Bethlehem.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

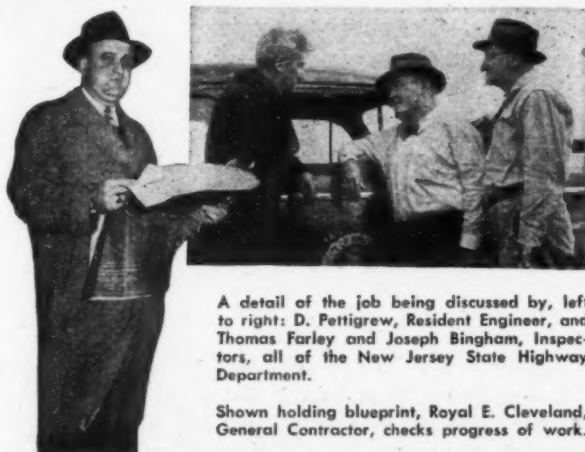
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

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Road Joints • Reinforcing Bars • Bar Mats
Guard Rail • Guard Rail Posts and Brackets
Wire Rope and Strand • Hollow Drill Steel
Fabricated Structural Steel • Sheet and H-Piling
Spikes • Bolts and Nuts
Timber Bridge Hardware • Tie-Rods



STEEL for HIGHWAYS



A detail of the job being discussed by, left to right: D. Pettigrew, Resident Engineer, and Thomas Farley and Joseph Bingham, Inspectors, all of the New Jersey State Highway Department.

Shown holding blueprint, Royal E. Cleveland, General Contractor, checks progress of work.



Smoothing operation prior to final brushing. Highway engineers estimate that by 1950, Route 25 may carry close to 75,000 cars daily.

ROADS AND STREETS

FEBRUARY, 1947

VOL. 90

No. 1

With Roads and Streets Have Been Combined
Good Roads Magazine And Engineering &
Contracting

In This Issue

Coming Articles

Helping a City Burst Its Seams

By Ray Webber, Assistant Construction Engineer, Oregon State Highway Department
Suburban retail merchants along this city-entrance highway widening project built a parallel service road and parking facilities at private expense

Widening and Stiffening a Suspension Bridge

Details of alterations made on the Bronx-Whitestone bridge in New York City to accommodate heavier traffic

American Road Builders' Annual Meeting

On-the-scene reporting of the wealth of detailed data expected to be presented at ARBA's Chicago convention, Feb. 17-20

Heater-Planer and Surface Heater Operation in Repairing

California Asphalt Roads

Notes on Los Angeles city and California state practice in smoothing corrugated surfaces

The Old Pay Check

A nation-wide tabulation of the salary scales of state highway employees

Good Contractor Planning on Eastern Airport

Paving methods at the Wilkes-Barre-Scranton airport—another ROADS AND STREETS staff report

Soil Compaction "Specs"

How the various state highway departments specify rolling density requirements and testing methods, as compiled by a Highway Research Board committee under L. D. Hicks of N. Carolina

Job and Equipment Ideas

Kinks for contractors and maintenance crews

Contractors at Work

Continuing the R&S series—next time, probably in March, we expect to feature Peter Kiewit Sons Company's U. S. 99 project in Washington

Also: Articles on equipment maintenance...pavement striping and traffic sign practice...shoulder maintenance...snow removal...aggregate production and control...low-cost highway stabilization...other timely subjects of interest to engineers, contractors, officials.

HAROLD J. MCKEEVER, Editor

C. T. MURRAY, Managing Editor

H. K. GLIDDEN, Contributing Editor

V. J. BROWN, Consulting Editor

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A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations, and to the construction and maintenance of airports.

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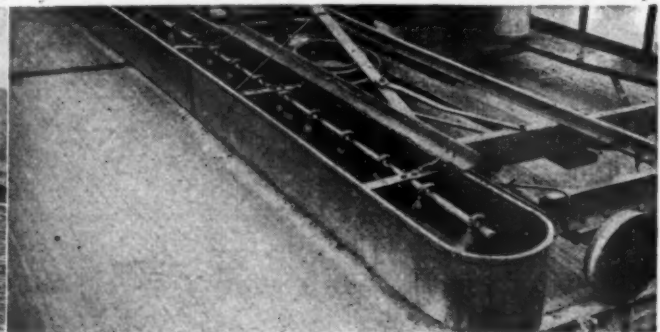
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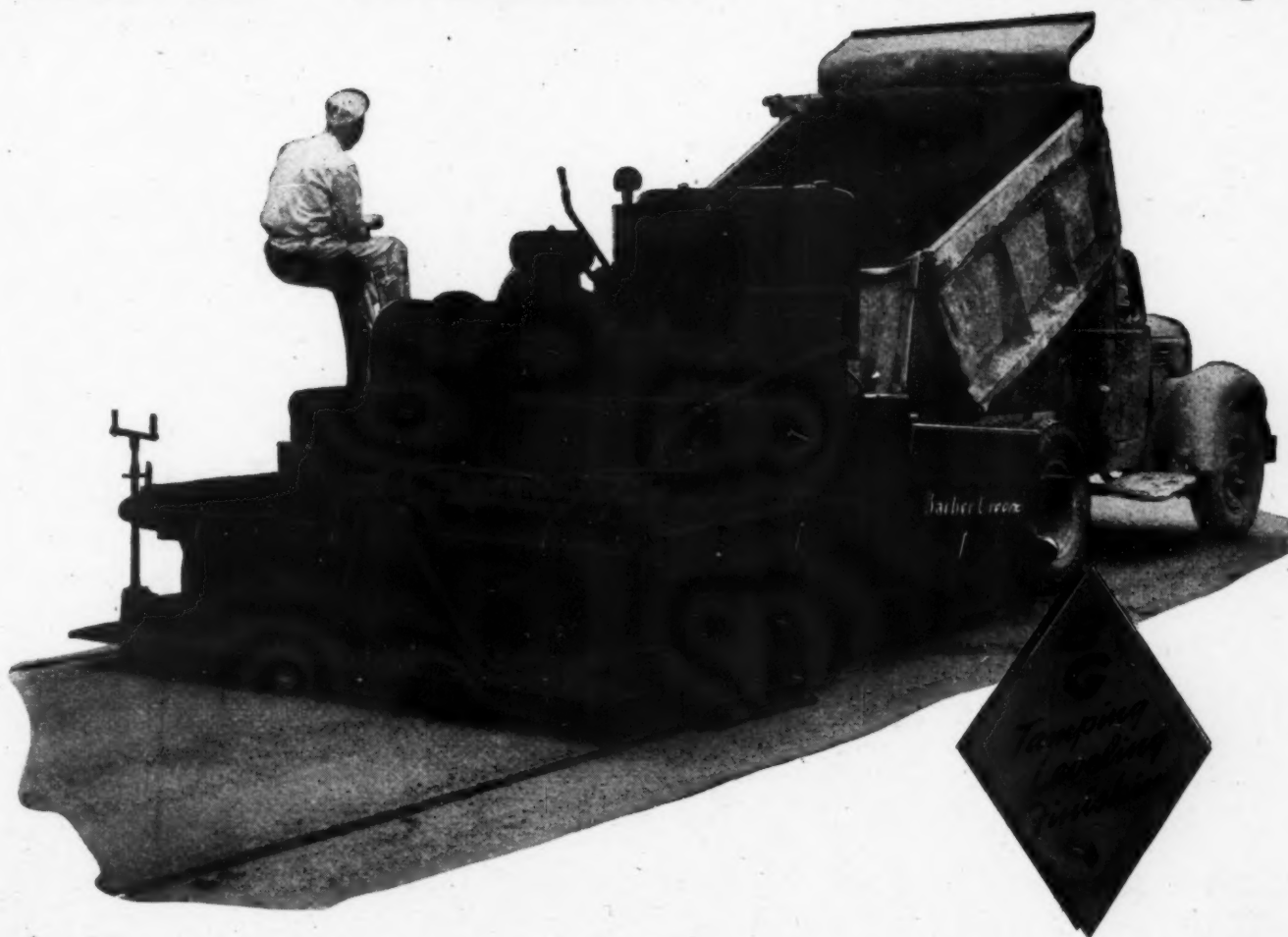
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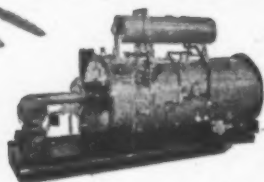
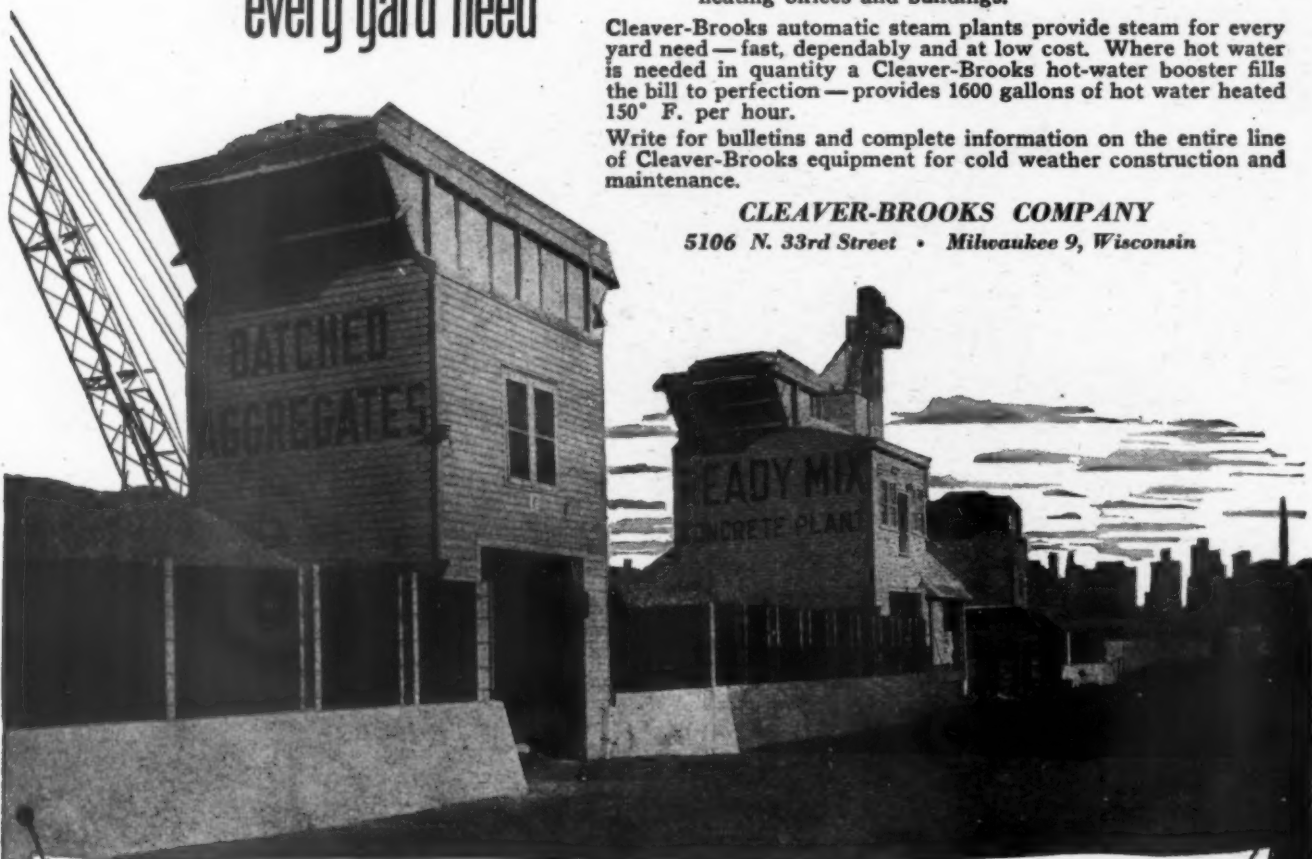
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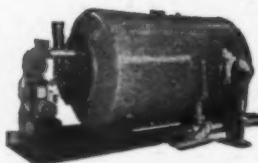
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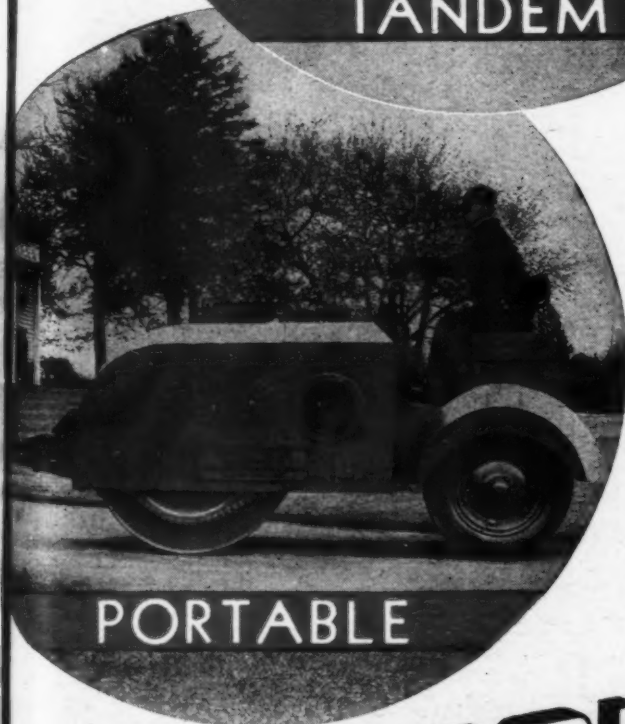
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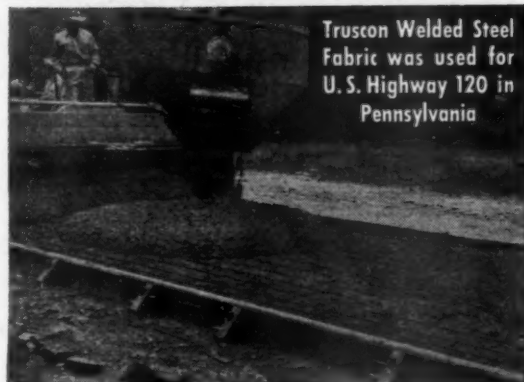
Provides resistance to the development of microscopic cracks into visible cracks.

Provides resistance to cracks opening and allowing entrance of water.

Provides resistance to broken ends of slabs separating at a crack.

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You can make short work of the toughest rock with this Blue Brute combination. Start with the New Worthington Wagon Drill, that swings its WD-40 Drifter into action at any angle . . . a fast, powerful drilling machine with a lot of improvements that make it the most versatile performer in its field.

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WORTHINGTON EQUIPMENT

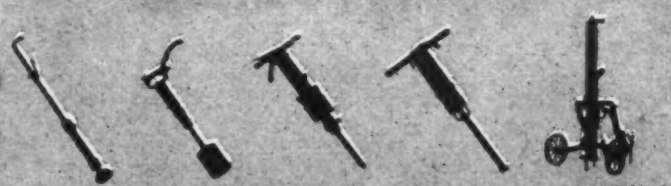
Gasoline and Diesel Driven Portable Compressors, Rock Drills, Air Tools, Self-Priming Centrifugal Pumps and Accessories.

Get more **WORTH** from air with **WORTHINGTON**


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Compressors from 60 to 500 cu. ft. capacity in mountings to suit all jobs. Rock Drills and Air Tools that have



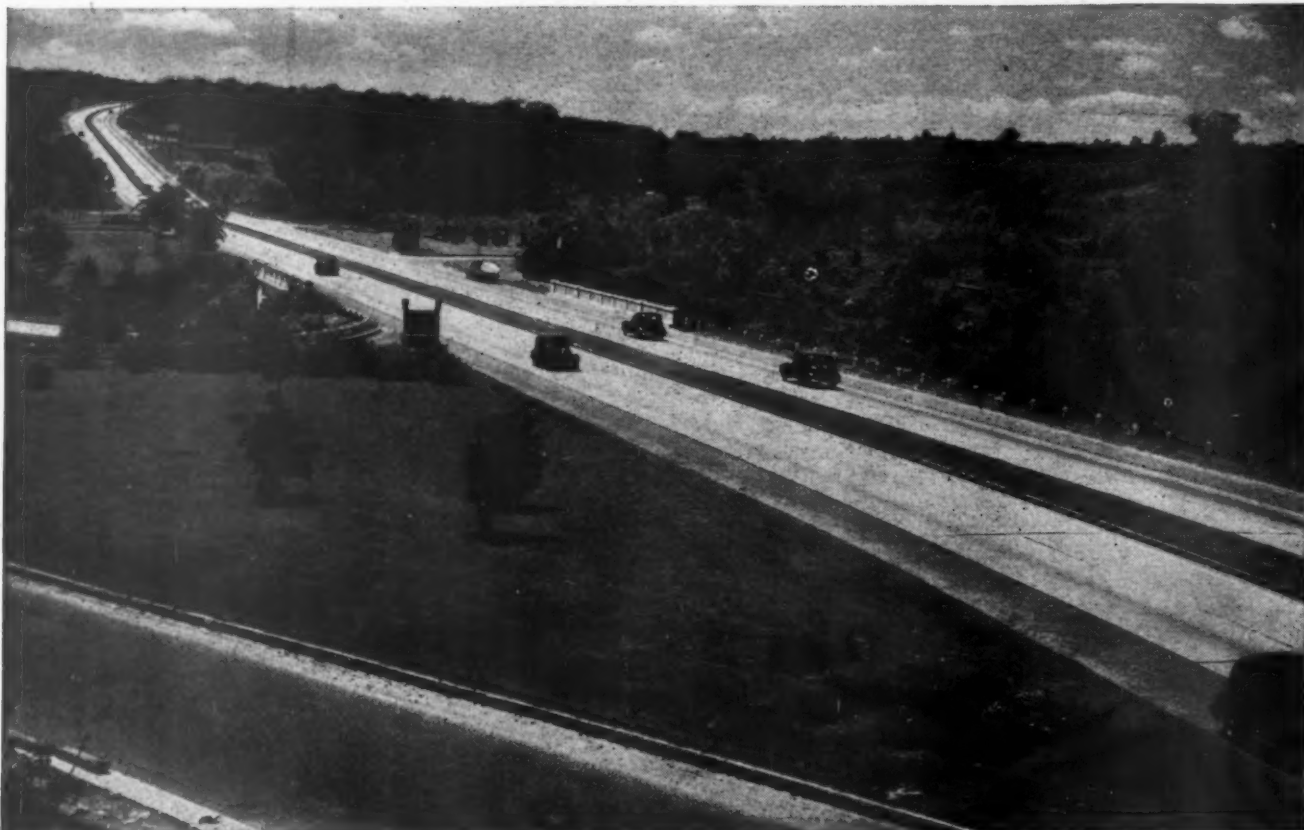
always set the pace for easy operation — available in a wide range of weights and sizes.



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Esteron 44—a powerful

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Especially useful against many types of woody plants, such as wild rose, poison ivy, mesquite and sprouts of many other woody species. Ideal for use on cut-over land along right of way.

Dow Contact Weed Killer

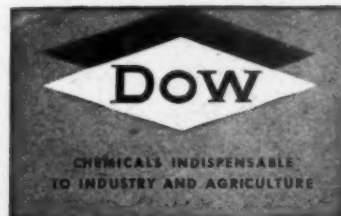
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Efficient Dirt Moving Hems in Old Man River

Three International TD-18 Diesel Crawlers moved 150,000 cubic yards of black gumbo with some sand and clay, in 60 calendar days. They were rebuilding a levee near West Memphis, Arkansas, on the Mississippi. Hauls were as long as 1200 feet, daily yardage as high as 30,000. And they loaded at small borrow pits *without pusher assistance* to get capacity loads in 10-yard scoops.

Performance like this points up the superiority of International Diesels for earth-moving. Their 4-cyle valve-in-head engines provide dependable, economical power. Perfect weight distribution, adequate ground contact, rugged construction and extremely durable moving parts give them the ability to handle the toughest earth-moving jobs with ease.

Their built-in, quick-starting system means that they waste no time getting to work. And the little time required



This International TD-14 with Trail-builder is shown leveling a haul road on approach to the levee. It also dressed the levee to grade and leveled off the dirt deposited by the three TD-18's and scoops. This is a fast, powerful and easy-to-handle Diesel Crawler —ideal for this work.

for maintenance means *more productive hours in every day.*

Yes sir! Your best bet for levee work, as for other earth-moving, is the International Diesel Crawler. Get the latest information, facts and figures on International Crawlers, Wheel Tractors, Power Units and Diesel Engines now in production, from the International Industrial Power Distributor near you.



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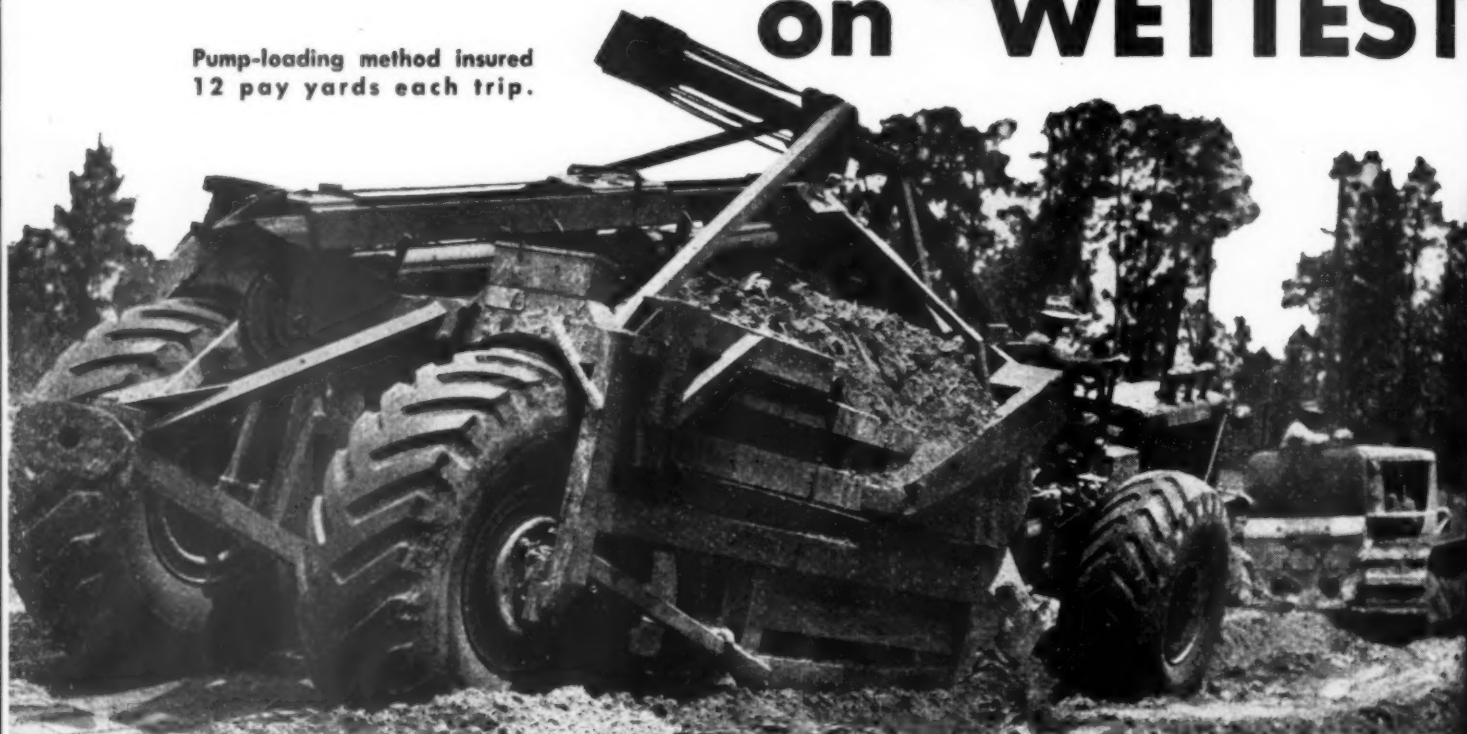
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12 pay yards each trip.



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6½ loads per hour on 5600' cycle

Typical production under these tough conditions shows each Tournapull made 5600' round trips every 7¾ to 8 minutes, averaged 6.5 loads per 50-minute hour . . . this, in spite of 500' of spongy

sand on entering borrow pit and soft spots in haul road requiring 3rd gear travel. L. S. Simpson, job superintendent for C. C. Moore Construction Co. says, "This job is approximately 30 days ahead of schedule due to speed of Tournapulls".

Repeat Tournapull buyer

C. C. Moore Construction Co., LeTourneau equipment owner for 15 years, has been a repeat buyer of Tournapulls since 1940 . . . has used their speed, versatility and mobility on all kinds of dirtmoving jobs.

Their fast, big rubber-tired Tournapull rigs were driven from Panama City, Fla. to this job — 90 miles in 7 hours — without damage to road surface or interference with traffic.

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RG C

LETOURNEAU PRODUCTS: Tournapulls*, Angledozer*, Bulldozers, Tiltdozers*, Carryall* Scrapers, Power Control Units, Rooters*, Tournatrailers*, Tournacranes*, Tournatrucks*, Sheep's Foot Rollers, Tournarope*, Tournaweld*, Tournalifts*.

* Trade Mark Reg. U. S. Pat. Off.

*For lowest
net cost per yard*

ays ahead of schedule ST ROAD JOB IN FLORIDA"



Heaped loads of sand were spread in 18 seconds.

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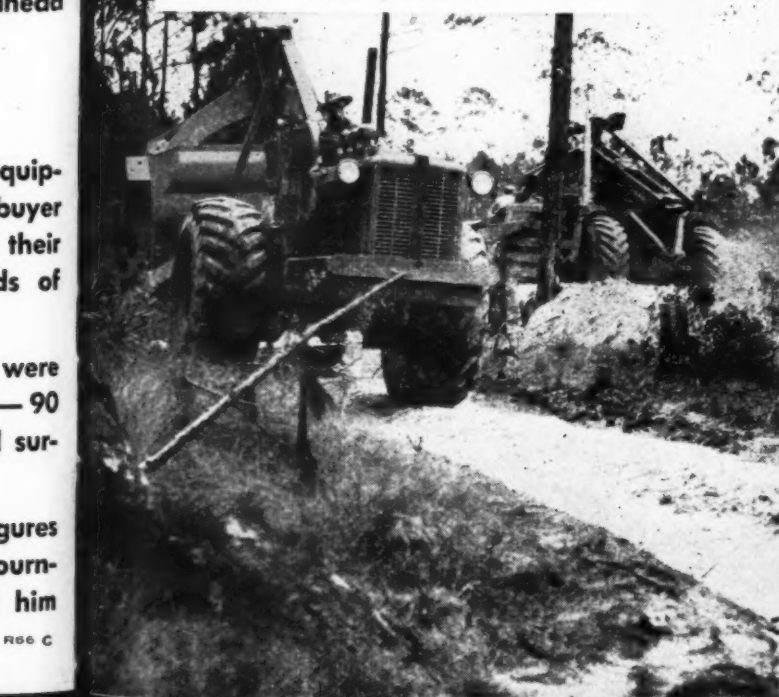
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R66 C

Some of the haul roads were narrow . . . in some places soft and spongy, requiring 3rd gear travel.

One-man operated Tournapulls load, haul and spread on 5600' round trip in 7 3/4 to 8 minutes.

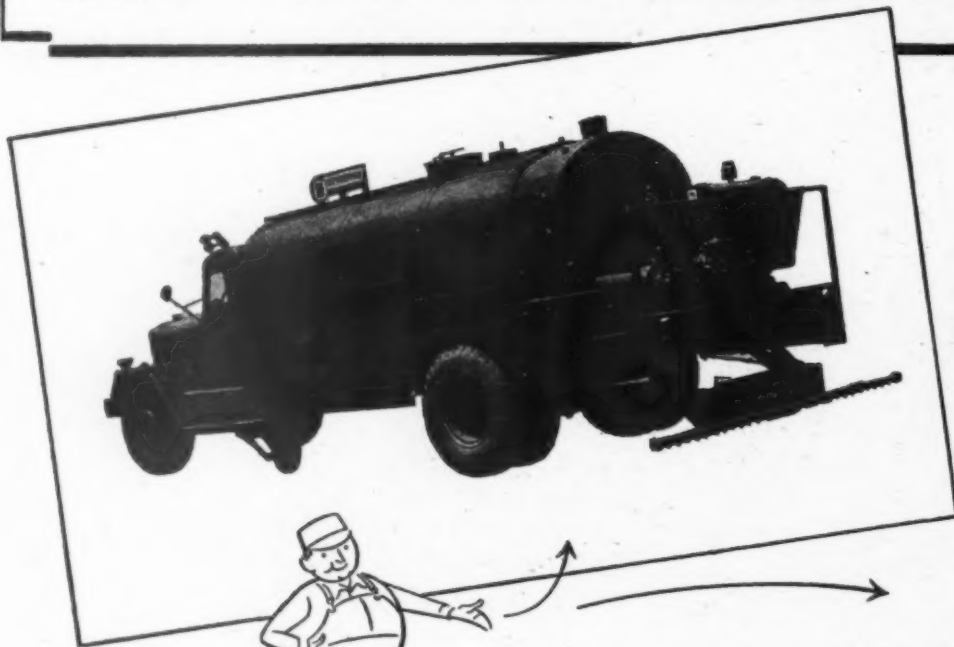


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PEORIA, ILLINOIS



TOURNAPULLS

LITTLEFORD'S BIG 4 HAVE ALL THE ANSWERS



SPRAY MASTER Pressure Distributor applies asphalt, road oils, emulsion with bar up to 24 feet wide. One valve operates entire spray.

LITTLE JOE KNOWS
LITTLEFORD



TANKAR STEAM HEATER develops steam in two minutes, heats tank cars in $\frac{1}{3}$ less time. Small, compact, completely automatic, easy to trail.



No. 108 POWER DRIVEN BROOM sweeps in either direction, only two minutes to change. Hydraulic lift regulates brush tension. Many other features.



SUPPLY TANKS, semi-trailer or truck types; standard frame, or famous frameless construction. Sizes from 1250 to 4000 gallons.

Little Joe listens in on the "power politics" of Littleford equipment and reports as follows: Whatever your job of black top construction or maintenance, these Littleford units will handle it swiftly, efficiently, economically. Littleford long has made black top road work the object of its engineering skill and equipment-

building facilities. Littleford equipment has many exclusive features and operating advantages, some of which are listed above. And there are alternate units, too, which may also interest you. Get the complete story by writing us today. Speed up and improve your black top work!



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LITTLEFORD BROS., Inc.

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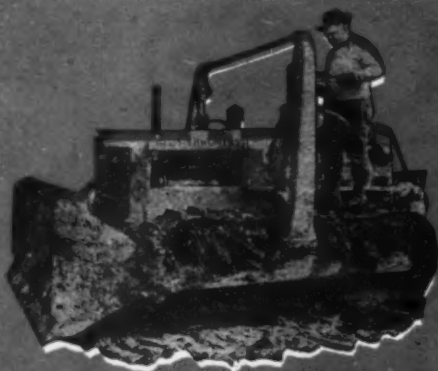
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NOW WITH 1,000 HOUR LUBRICATION

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Front Idlers

Support Rollers



GREASING JOB IS EASY FOR THIS OPERATOR

... no fighting through mud to reach truck wheels, front idlers and support rollers! With Allis-Chalmers' 1000-hour truck assembly lubrication, operator can select convenient time and spot to replenish lubricant.

"GOODBYE" to old-fashioned, expensive, time-consuming tractor maintenance methods.

NOW . . . truck wheels, idlers and support rollers on all Allis-Chalmers crawler tractors are GREASE-PACKED at the factory. Lubricant needs only to be replenished . . . not replaced . . . once every 1,000 hours. That's . . . ONCE IN SIX MONTHS . . . on a 40-hour week basis! This long interval is made possible by taking full advantage of the improved Positive Seal, exclusive in A-C tractors.

What it means! Relieves you of the responsibility of frequent lubricating attention . . . results in less down time for greasing or repairs . . . considerably reduces lubricant cost . . . adds a factor of safety by assuring adequate lubrication for long operating periods. Result — your maintenance cost is reduced and tractor operating life extended.

For the full story of this and other features which make Allis-Chalmers tractors steady, high yardage movers, contact your Allis-Chalmers dealer.



ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.



Maintenance expense on a road like the one shown above would soon pay for a durable Soil-Cement highway such as is shown at left.

Soil-Cement is Low Cost — You Already Own 90% of Material Needed

SCIENTIFIC control insures predictable results in mixing portland cement with the materials already on your road site—approximately 9 parts of free roadway soil to 1 part of cement. There's no guesswork in this economical, modern technique of transforming old high-maintenance-cost earth or granular base roads into durable, all-weather Soil-Cement paving.

Naturally construction costs are low, making it economically feasible to provide this long-lasting all-weather surface for your lighter traffic roads and streets. More than ten years of scientific research has proved that Soil-Cement pave-

ment can be accurately designed for such traffic.*

You can build Soil-Cement with confidence. Standards for Soil-Cement testing procedure have been adopted by the American Society for Testing Materials and the American Association of State Highway Officials.

*Write for free illustrated folder, "Soil-Cement for Light Traffic Roads and Streets." Distributed only in United States and Canada.

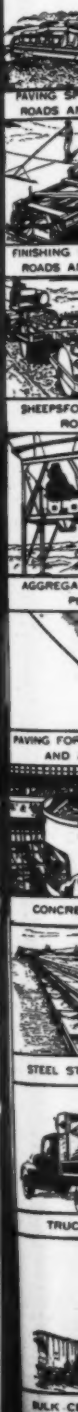
**Pave and Save
with Soil-Cement**

PORTLAND CEMENT ASSOCIATION

DEPT. A2-28, 33 WEST GRAND AVE., CHICAGO 10, ILLINOIS

A national organization to improve and extend the uses of concrete
... through scientific research and engineering field work

You c
shown
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digging
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which
Get
or files



...Bucket selection made

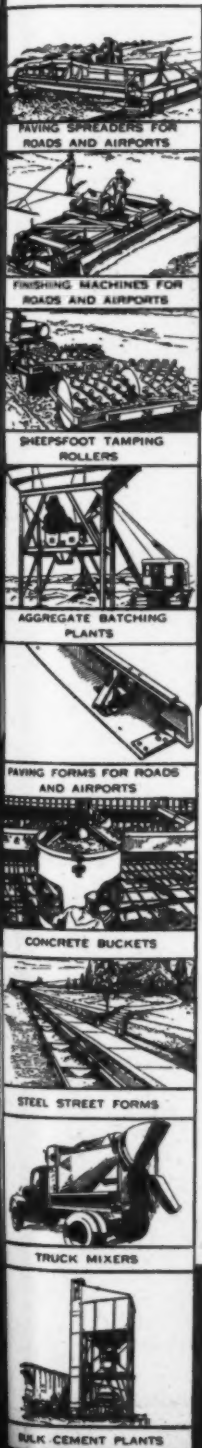
EASY!

You can't go wrong! Exactly the bucket you need is shown in picture and with complete data—in Blaw-Knox Catalog No. 2076.

Here you have the most convenient clamshell bucket catalog ever published—now it is easy to select a bucket for any kind of rehandling, digging or dredging.

Hundreds of buckets to pick from—your job, your equipment, and your conditions can be exactly met—and you will get a bucket which really performs.

Get Catalog No. 2076—for your library or files—its yours for the asking.



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BARGE CLEANUP
GENERAL PURPOSE
HARD DIGGING
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INDUSTRIAL USES

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TWO-LEVER ARM
BUCKETS

Just check
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Crane Capacity ✓

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—and select EXACTLY
the BUCKET you need
from Catalog No. 2076

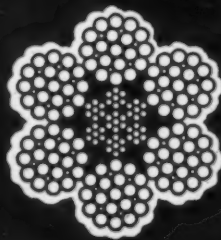
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OF BLAW-KNOX COMPANY
2003 Farmers Bank Bldg., Pittsburgh 22, Pa.
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CONSTRUCTION EQUIPMENT

Best for Heavy Hoisting



UPSON-WALTON 6 x 19 FILLER WIRE CABLE



by Upson-Walton 6 x 19 Filler Wire Perfection Layrite.

Perfection grade because this improved plow steel is the strongest and toughest and most resistant to wear of all the grades of wire used to make rope.

Layrite because this fine preformed wire rope results in longer life, greater safety, greater economy.



Established 1871

*All Upson-Walton Products Available
Through Your Local Upson-Walton Distributor*

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THE UPSON-WALTON COMPANY

Manufacturers of Wire Rope, Wire Rope Fittings, Tackle Blocks

MAIN OFFICES AND FACTORY: CLEVELAND 13, OHIO

114 Broad Street
New York 4

737 W. Van Buren Street
Chicago 7

241 Oliver Building
Pittsburgh 22



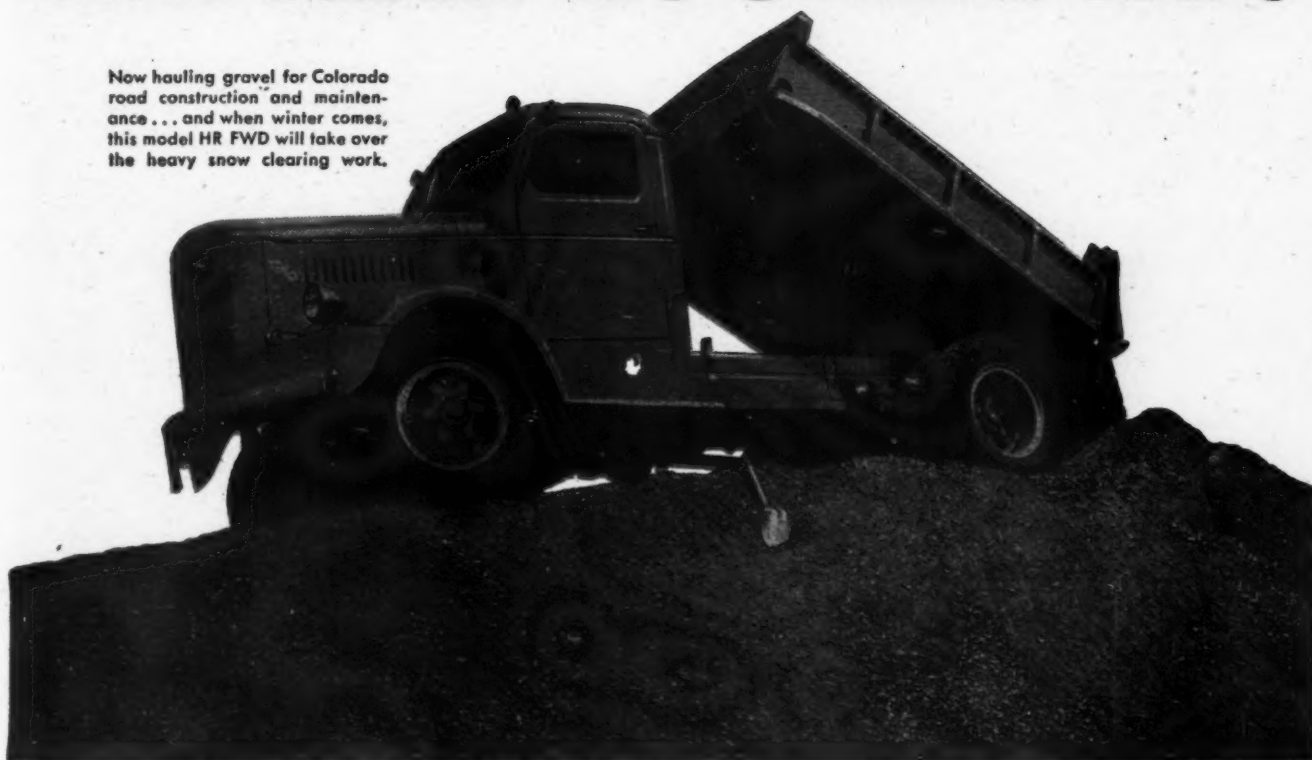
Hemp center or, where hoisting conditions are extremely severe, IWRC (independent wire rope center)

Upson-Walton, 6 x 19 Filler Wire cable is the wire rope which provides a fine balance between coarser ropes, which have good abrasion resistance but poor flexibility, and flexible ropes with less abrasion resistance. *Upson-Walton 6 x 19 Filler Wire cable combines good flexibility with good abrasion resistance.*

The filler wires support uniform outer wires, thereby giving the rope a greater resistance to crushing and other damage where radial pressures and operating conditions are severe. This construction provides a high percentage of reserve or internal strength.

ON ALL HEAVY WORK ALL YEAR 'ROUND..FWDs

Now hauling gravel for Colorado road construction and maintenance... and when winter comes, this model HR FWD will take over the heavy snow clearing work.



The same rugged plow-equipped FWDs that smash through heavy snow banks to keep highways open throughout the winter, are also unexcelled all the rest of the year for road construction and maintenance work. The "ONE truck for MANY jobs" takes on ALL kinds of heavy work, all year 'round, with dependability and

dispatch, at low cost. FWDs are a sound investment for highway construction and all-year maintenance. They remain first choice in this heavy-duty highway field because the true FWD four-wheel-drive principle gives FWDs what it takes for consistent, outstanding performance. See the nearest FWD Distributor, or write to...

THE FOUR WHEEL DRIVE AUTO CO., Clintonville, Wisconsin
Canadian Factory: KITCHENER, ONTARIO



Foremost Heavy-Duty Truck

One of seven new FWD Model HA trucks added to the Utah State Highway Commission's fleet, with 1100-gal. oil tank, for road surfacing.



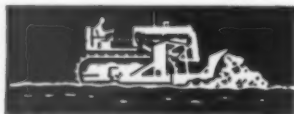
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**USERS
WRITE THE BEST ADS**

"There's a place for tracks

We use both—and they're all

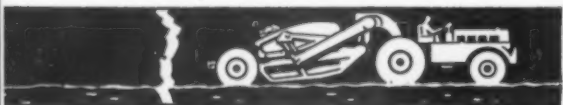
"Caterpillar" builds the units you need to zone equipment for lowest costs on earth:



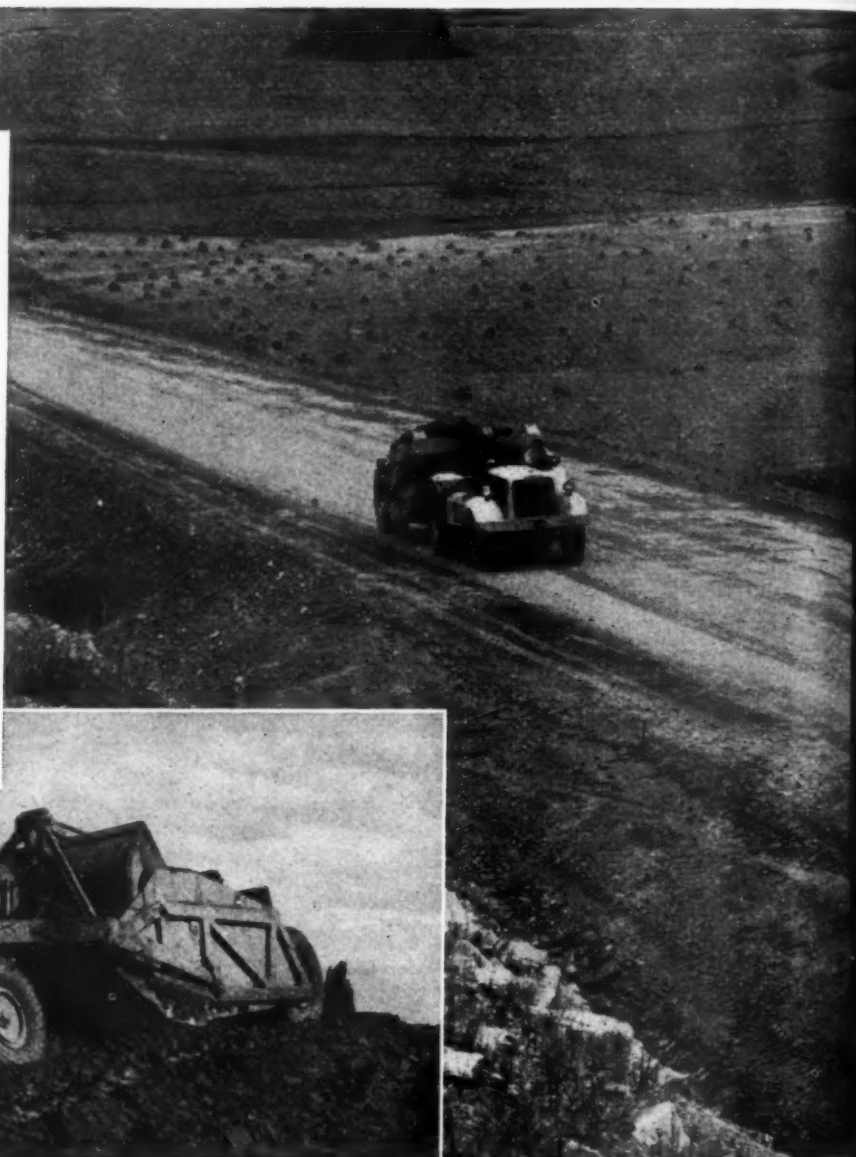
1 Track-type tractors for "push"-distance earthmoving.



2 Track-type tractors for loading and pulling scrapers on medium hauls.



3 Wheel-type tractors for high-speed long hauls —plus motor graders for finishing work.



CATERPILLAR

REG. U.S. PAT. OFF.

ENGINES • TRACTORS • MOTOR GRADERS • EARTHMOVING EQUIPMENT

and a place for rubber

'Caterpillar' Diesels'' —Leon Joyce, Rochester, Minn.

Straightening and elevating a section of new state highway near Preston, Minnesota, contractor Leon Joyce has cut yardage costs to a minimum with "Caterpillar" Zoned Equipment. That means making the most efficient use of both track-type and wheel-type tractors to move earth.

Included in Joyce's all-"Caterpillar" team are Diesel D8s and D7s, with the rugged traction for bulldozing, push-loading and pulling scrapers on short hauls; "Caterpillar" Diesel DW10 Tractors, making fast time on the two-mile scraper hauls required for this job; and "Caterpillar" Diesel Motor Graders to maintain haul roads and do the finishing.

As on most of today's big contracts, tracks and rubber fit together like gears in a machine. "Caterpillar" builds both—and backs both with the service of a great dealer organization.

CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS



DIESEL

—for lowest costs on earth



a man's a

giant

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BARCO

Barco is the accepted tool on thousands of hurry-up jobs all over the world. Foremen know that a worker gets powerful muscles of steel when you team him with a Barco Portable Gasoline Hammer. He works harder and faster with this tireless tool. The toughest going—even in hard-to-reach spots—becomes easy. Eleven special attachments make a Barco useful on dozens of *different* jobs.

BREAKING • DRILLING • DRIVING • TAMPING

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● **PORTABLE GASOLINE HAMMERS**

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IN CANADA: THE HOLDEN CO., LTD., MONTREAL, CANADA



... perhaps a Huber 3-Wheel Road Roller is a little too "husky" to take on a dinner date, but owners and operators are mighty proud of their Hubers—the way they perform — the easy way they handle — their speed, power, and stamina — the economical way they operate — they like to have one handy in case a tough job comes up in a hurry. Huber 3-Wheel Rollers travel in the best of road building society. See your Huber Distributor for a demonstration.

THE **HUBER** MFG. COMPANY • MARION, OHIO, U. S. A.

HUBER

3 Wheel • Tandem ROAD ROLLERS and MAINTAINERS

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A 'BIG TIME' RIG in a little package

WE WORKED our 10-B every day for nearly two years . . . "In 22 months of fast, steady operating we had only 5 hours lost time"

"Only minor repairs in over two years of steady service" . . .

These are typical of owners' comments describing the 10-B's ability to keep on delivering high speed output day after day. From actual operation they've learned that the 10-B is unmatched for speed in its class and that it's packed with time-saving features which permit making maximum use of its speed each shift: Easily made last-ing adjustments, easy maintenance, coordinated cycle, conveniently grouped controls, plenty of propelling speed and climbing ability. Ask any 10-B owner about the 'big-time' performance of this machine.

$\frac{3}{8}$ YARD

10-B

**BUCYRUS
ERIE**

SOUTH MILWAUKEE, WISCONSIN

you make the
most of
EVERY HOUR
with a
BUCYRUS-ERIE

Moto-Paver

THE COMPLETE TRAVELING MIXER AND PAVER

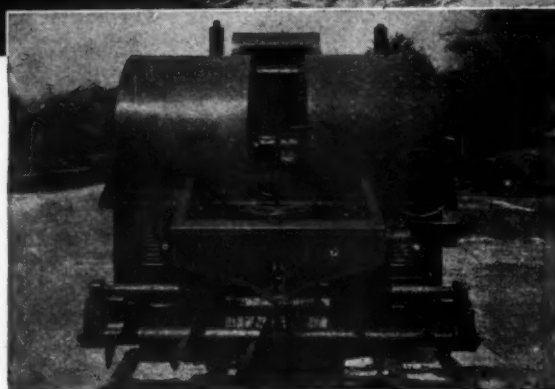


- ★ SELF-CONTAINED ★ SELF-PROPELLED
- ★ MIXING CAPACITY 100 TO 120 TONS PER HOUR
- ★ PAVING SPEED 4 TO 50 FT. PER MIN.
- ★ ROAD SPEED UP TO 18 MILES PER HOUR

MIXES, SPREADS AND LAYS ANY TYPE OF MIXED-IN-PLACE BITUMINOUS MATERIAL TO ANY ROAD WIDTH, THICKNESS AND CROWN CONDITION

The Moto-Paver does the *complete mixing and paving job*. No separate loader or spreader is required—no trailer to haul the machine from one job to another.

This highly flexible mobile plant is especially adapted for resurfacing work on county roads and city streets, because of the different



Rear view, with strike-off bar removed to show the patented spreading arrangement and controls

types of pavement that can be produced with it, and because it can be quickly moved from one job to another under its own power. The Moto-Paver is also highly efficient on new construction.

Bulletin MP-46, giving complete information and specifications, will be sent on request.

HETHERINGTON & BERNER INC. • 721 KENTUCKY AVENUE, INDIANAPOLIS 7, INDIANA

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BUILDERS OF PORTABLE AND STATIONARY ASPHALT PLANTS OF ALL TYPES AND CAPACITIES

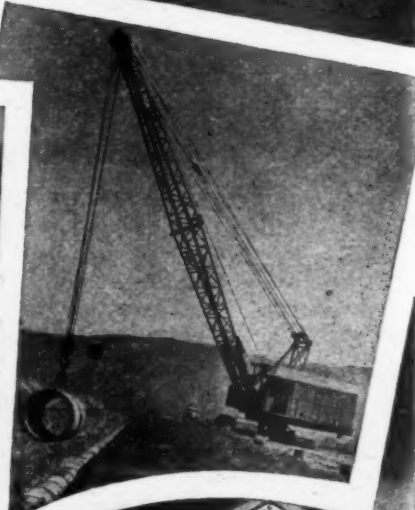
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LIMA enters 1947 the
pacemaker among
shovels, draglines and
cranes. Efficient high speed op-
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tinues to smash performance
records everywhere. In brick
plants, quarries, sand and gravel
pits, coal and metal mines, lum-
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LIMA is giving the kind of ser-
vice that users want—service
that steps up production and
delivers big output at low cost.
LIMA shovels are built in ca-
pacities ranging from 3/4 yard
to 5 yards and crane capacities
range from 13 tons to 100 tons.
Bulletins sent on request.

LIMA LOCOMOTIVE WORKS, INCORPORATED
Shovel and Crane Division
Offices in Principal Cities
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Against
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THE LIMA DIAMOND
FOR 75 YEARS AN EMBLEM OF
QUALITY WORKMANSHIP



**SHOVELS
DRAGLINES
and CRANES**

REGISTRATIONS SHOW IT—
OPERATORS KNOW IT!



90 ⁶ H.P.
YOUR PICK OF POWER
100 ⁸ H.P.

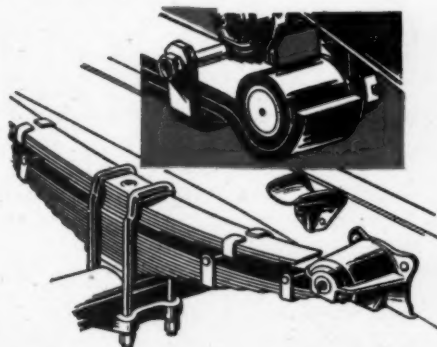


This heavy duty 134-inch wheelbase Ford, equipped with Thornton Drive, is discharging ready-mixed concrete from its 4-cubic-yard Dumpcrete body, built by Mazon Construction Co., Dayton, Ohio.

"FORD TRUCKS LAST LONGER!"

ONE big reason: FORD SPRINGS STAND UP!

Ford spring engineering provides unsurpassed endurance. Ford special alloy spring steel, with tensile strength of 200,000 pounds per square inch, assures high fatigue resistance, while deflection rates scientifically proportioned to each vehicle's gross weight assure good riding with generously ample load capacity. Long-wearing shackle bushings of steel-backed bronze reduce maintenance expense. Ford special, wrapped "safety eyes" on heavy duty front springs (illustrated) reduce stress on main leaves, afford longer life and extra safety. Hydraulic double-acting shock absorbers on light duty models further ease the ride and control the load.



Ford



ONLY FORD GIVES YOU ALL THESE LONG-LIFE TRUCK FEATURES: Your choice of two great engines, the 100-H.P. V-8 or the 90-H.P. Six—semi-centrifugal clutch that needs no maintenance lubrication—rear axle design that takes all weight-load off the shafts ($\frac{3}{4}$ -floating in half ton units, full-floating in all others)—heavy channel section frames, *doubled* between springs in heavy duty models—big, easy-action brakes, with heavy, cast drum surfaces, non-warping and score-resistant—extra-thick sheet metal in cabs, cowls,

skirts and fenders—all told, more than fifty such examples of Ford endurance-engineering. That's why **FORD TRUCKS LAST LONGER** . . . why 7 out of 11 of all Ford Trucks built since 1928 are still in service. No wonder the average age of all Ford Trucks in use is nearly 9 years! Stamina is built into them! See your Ford Dealer NOW!

FORD TRUCKS

MORE FORD TRUCKS IN USE TODAY THAN ANY OTHER MAKE

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GOING INTO MORE AND MORE CONTRACTORS' EQUIPMENT



DIESEL BRAWN WITHOUT THE BULK

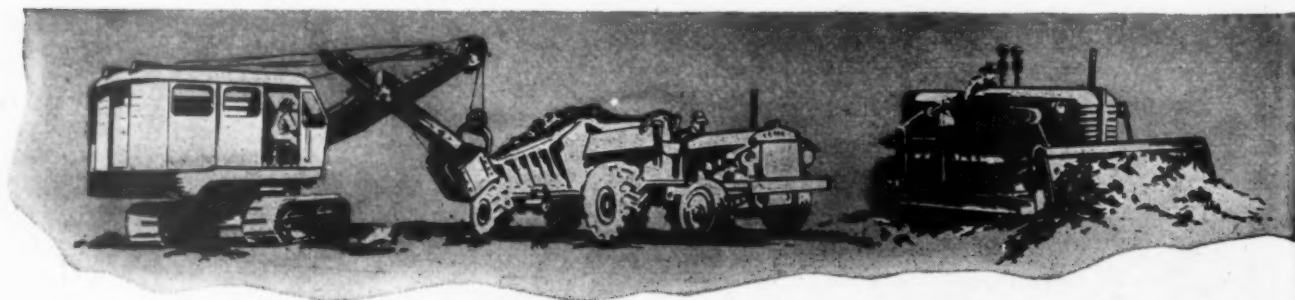
Every day sees more and more General Motors 2-cycle Diesel engines going into contractors' equipment.

The reason is clear. These tough, dependable Diesels provide great power in moderate space and weight. They start easily—pick up their load fast—and run more smoothly.

All because GM Diesels produce power at every piston downstroke. Not a piston loafs through a single revolution.

At the same time, these engines are designed for easier servicing. There's no high-pressure fuel tubing. Injector, pump and metering mechanism are all in a single unit that can be changed in a matter of minutes. When needed, genuine GM replacement parts are always readily obtainable.

Any machine with GM Diesel power is a better machine—sturdy, dependable, economical. So whatever equipment you buy, specify a GM Diesel engine.



GM DIESEL DISTRIBUTORS

All over the country there are competent industrial distributors of GM Diesel engines. They are ready to supply contractors and construction men with equipment powered with GM 71 Diesel engines, with skillful service, and with genuine GM replacement parts.

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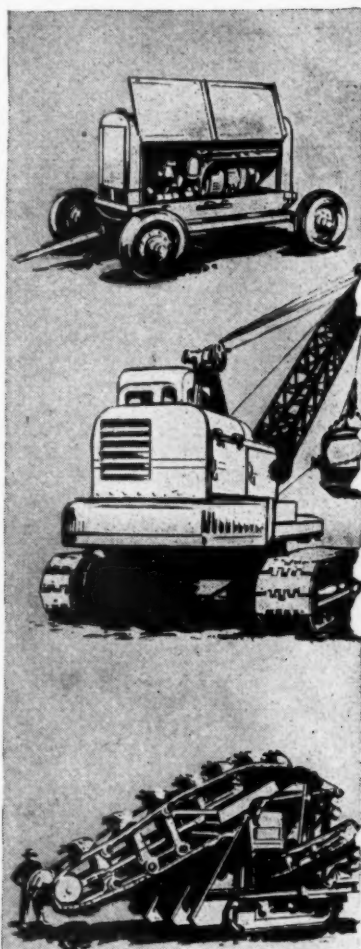
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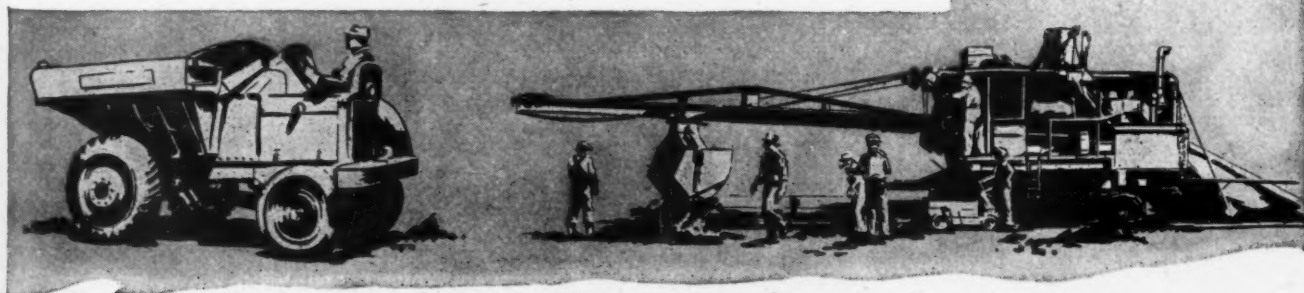
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DETROIT DIESEL ENGINE DIVISION

DETROIT 23, MICH. • SINGLE ENGINES Up to 200 H.P.
MULTIPLE UNITS Up to 800 H.P.

GENERAL MOTORS



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This Machine Sure "Gets Around"!

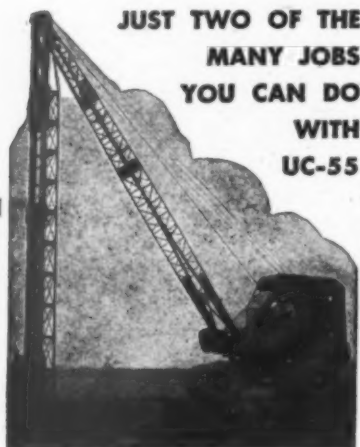
... SPEEDY TO THE JOB ...

POWERFUL AND STEADY ON THE JOB!



IT'S THE LINK-BELT SPEEDER WHEEL-MOUNTED UC-55 "SHOVEL CRANE"

**DRIVING
PILES ON
BRIDGE
REPAIRS**



**JUST TWO OF THE
MANY JOBS
YOU CAN DO
WITH
UC-55**

DITCHING WITH DRAGLINE



You get to the job quickly with a wheel-mounted Link-Belt Speeder UC-55 and when you get there, you get into operation quickly, with plenty of power, and a steady machine that handles a wide variety of operations. One-man operated, it travels at 10 m.p.h. on the highway, negotiates rough ground easily, and has four-wheel drive for heavy going.

Hydraulic stabilizers lock the oscillating front axle, compensating for uneven ground preventing tipping and taking strains off working parts.

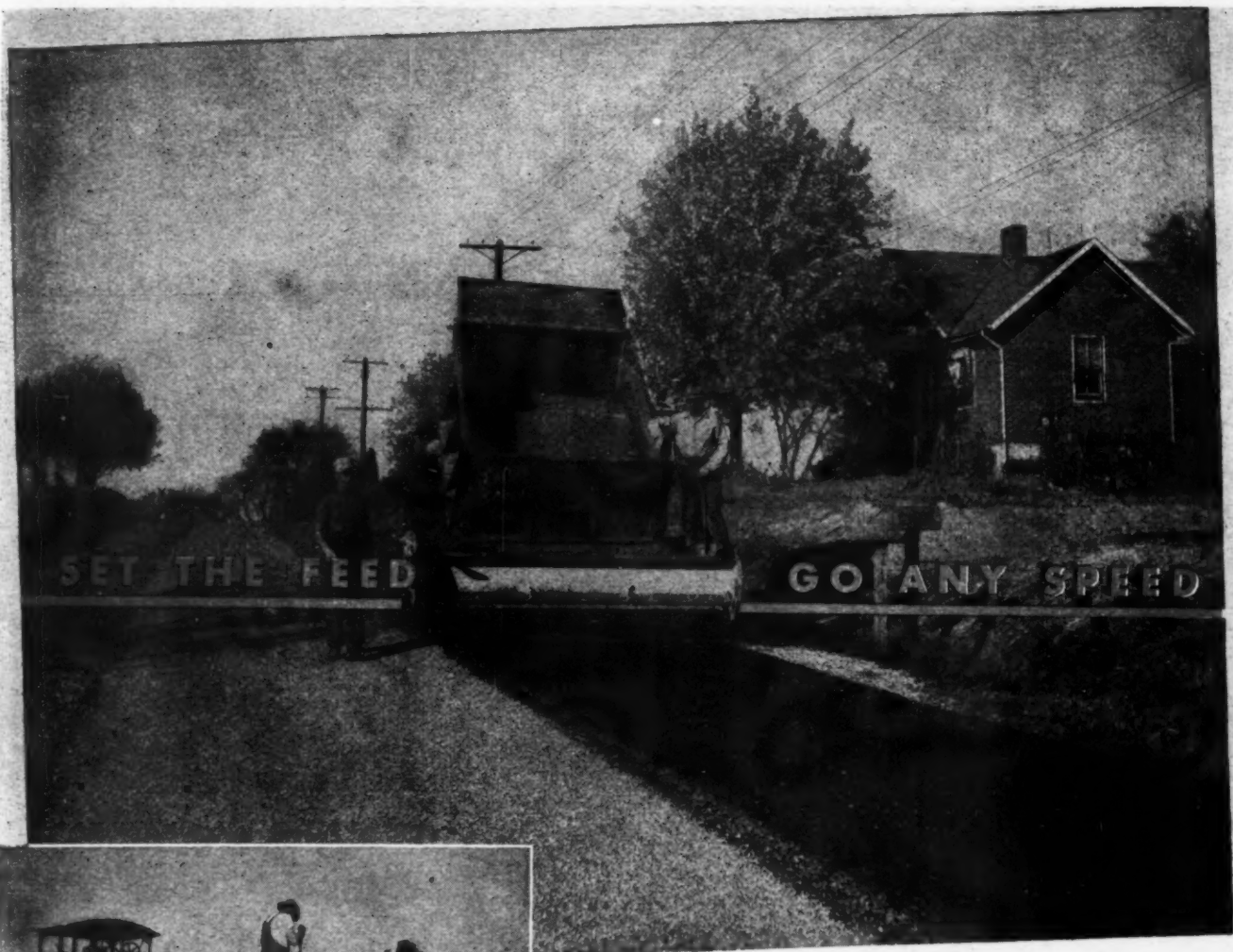
Twin Disc Hydraulic Power take-off lengthens cable life and saves machine from shocks. Like all Link-Belt Speeders, it is quickly converted from shovel to crane, dragline, trench-hoe, pile driver, etc.

You'll go places in a hurry with a Link-Belt Speeder UC-55!

10,541

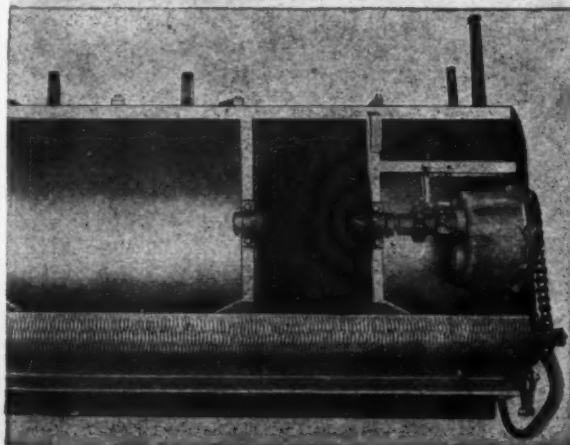
LINK-BELT SPEEDER

Builders of the Most Complete Line of
SHOVELS-CRANES-DRAGLINES
LINK-BELT SPEEDER CORPORATION, 301 W. PERSHING ROAD, CHICAGO-9, ILL.
A DIVISION OF LINK-BELT COMPANY



SET THE FEED . . . GO ANY SPEED

Wheel shaft of spreader drives feed roll through transmission . . . Speed of feed roll rotation increases or decreases in exact proportion to increase or decrease of wheel rotation. Result is an even material feed per foot of travel as set by the shutter bar . . . no matter how fast or varied the speed may be. Transmission shifts for travel either forward or backward. Shutter bar adjusts for both level and taper spread.



Spread to a constant-depth **FAST** with a Buckeye **SPREADER**

Buckeye Spreaders save you both time and material waste. Because the feeder roll rotates in exact ratio to the spreader wheels, you can go at any speed and maintain an accurate depth or volume of spread for every foot of travel. Typical application is shown above. The Spreader averaged about a mile a day in resurfacing a St. Louis county highway in Missouri. The job consisted of spreading a first course of $\frac{3}{4}$ " penetration limestone, followed by asphalt, with a final course of pea gravel. Buckeye Spreaders, conventionally used in hook-ups with dump trucks, may be also used for special jobs with road graders and similar equipment as shown above, left. Write for the Buckeye Spreader Bulletin for complete information.

BUCKEYE TRACTION DITCHER

Division of Car Wood Industries, Inc.

FINDLAY

OHIO

Cultivate Good Buying Habits . . . Now



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SPEED and ECONOMY on Wheels!

FINGERTIP AIR CONTROLS
ONE-MAN OPERATION
¾ YD. and ½ YD. SHOVELS
6 to 12 TON CRANES

No waiting — no delays! Out on the job or around the yard MICHIGAN Mobile CRANE'S time-saving, cost-cutting operating speed, economy and truck mobility pays off on every lifting and excavating job. Long-time MICHIGAN owners will tell you that for crane, clam-shell, dragline, trench hoe and shovel work the fully convertible MICHIGAN Mobile SHOVEL-CRANE is truly "speed and economy on wheels"!


Get all the facts — send for Bulletin RS-27.



MODEL TLDT-20 CRANE 12-ton capacity. Power lowering as well as lifting. Large heavy duty hoist drum for precision crane work. Timken tandem dual drive axle. Total reduction in low gear 72.88-1. Four Timken-Westinghouse Air Brakes. 30 MPH travel speed.

MICHIGAN
POWER SHOVEL COMPANY
BENTON HARBOR, MICHIGAN

What a Haiss Snow Loader does for many cities... and can do for you!

- 
- *One machine does the work of 80 men shoveling snow by hand.*
 - *Pays for itself each winter—100% return on investment annually.*
 - *Dependable—available any hour, night or day, at a moment's notice.*
 - *Fast—cleans up congested traffic areas in a few hours.*
 - *Loads 15 yards a minute.*
 - *Reduces truck rentals \$200 to \$300 or more per 8-hour shift.*
 - *Breaks up and handles hard and frozen snow better than any other machine—due to chopping action and upward lift of cutting blades.*
 - *Mobility—changes location quickly—6½ miles per hour traveling speed.*

Haiss is now a wholly-owned subsidiary of Pettibone Mulliken Corporation of Chicago. With new management and much larger resources, Haiss can now do a still better job for its customers... better machines and servicing, larger production, quicker deliveries.

Haiss specializes in equipment to load bulk materials... snow, sand, gravel, stone, coal, topsoil, etc.

Its machines are money-makers for their owners.

George Haiss Manufacturing Co.
381 Canal Place
New York 51, N. Y.



for Safe, Easy Operation

Husky, powerful machines . . . built to handle the most difficult work . . . yet, with OSGOOD Air Control, operating an OSGOOD is simple and easy. A bank of five hand levers and two foot pedals, all within convenient reach of the operator, provide safe, positive control of the principal operations of an OSGOOD.

And OSGOOD Air Control is measured—low pressure for smooth, even operation, high pressure for powerful, steady travel. Here's ease of operation that means more work, in less time, on any job. Plan now to choose an OSGOOD . . . a complete line of power shovels, draglines, cranes, clamshells, backhoes and pile drivers . . . a model for every type of work.



POWER SHOVELS • CRANES • DRAGLINES • CLAMSHELLS • BACKHOES • PILE DRIVERS

THE **OSGOOD** CO. **O-G** THE **GENERAL** CO.
EXCAVATOR

MARION OHIO

DIESEL, GASOLINE OR ELECTRIC POWERED • $\frac{1}{2}$ TO $2\frac{1}{2}$ CU. YD. • CRAWLERS & MOBILCRANES



His Sense Saved My Dollars!

Talk about a money-saving idea, this one that my Oliver "Cletrac" dealer suggested really takes a prize! We were doing the dirt moving on this ground-leveling job, and what with high costs and weather troubles, were getting a little worried about both time and money.

Our Oliver "Cletrac" man came out to look over the job one day, and I did a little high-class beefing about the whole thing. Then he popped this one. "Why not build a sunken loading platform to load out the trucks?" he asked. "Then your tractor-scraper unit can haul the dirt up on the platform and dump it through an opening into the truck body. You'll eliminate a shovel and save a lot of time that way, and time is money these days."

It was a darn good idea—one we just had overlooked. We went to work on it right away and believe me, it really saved our hides. That Oliver "Cletrac" man sure knows the dirt-moving business and he's a good man to know!

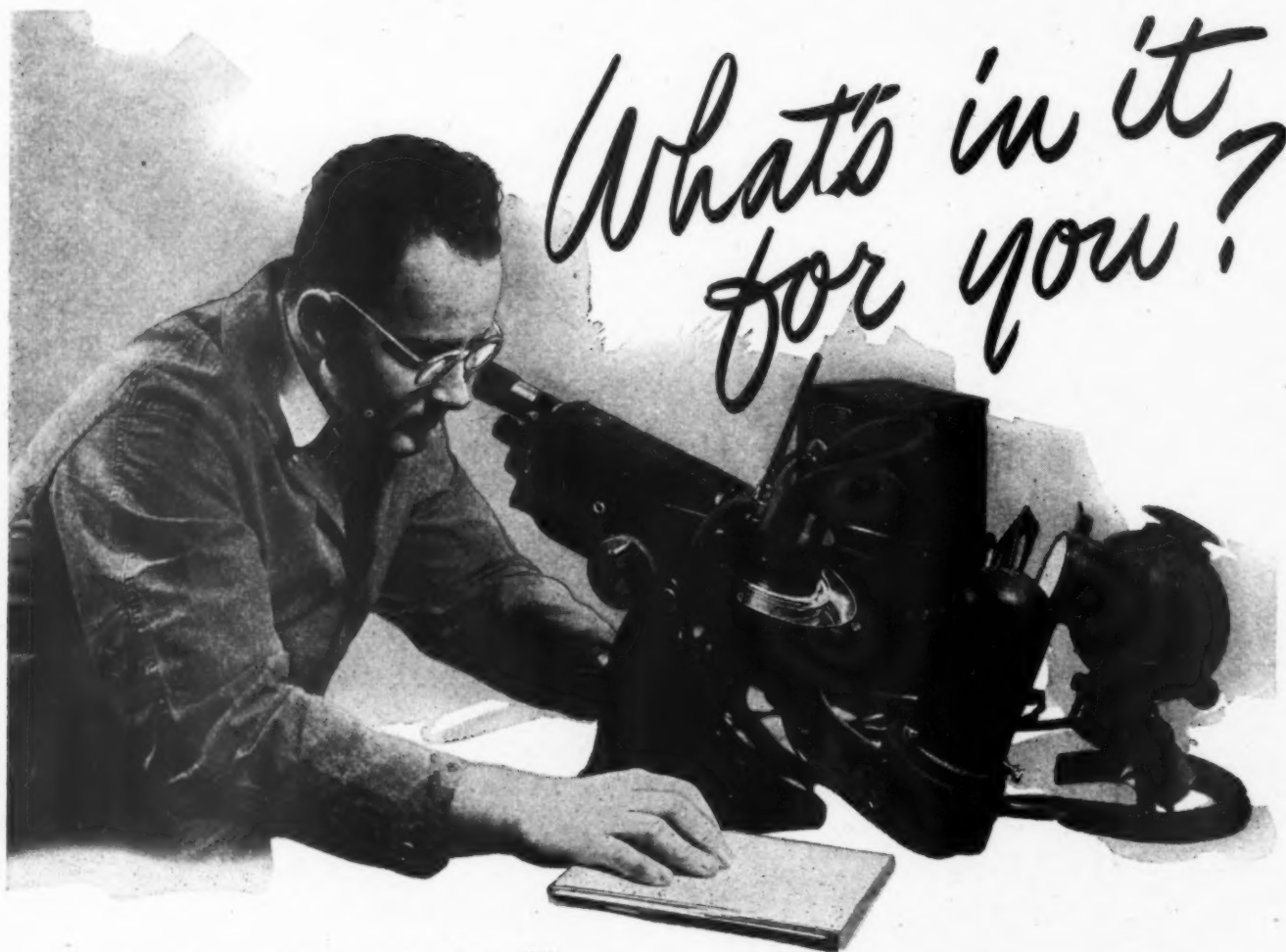
Cletrac
a product of
The OLIVER Corporation



"THE SIGN OF EXTRA SERVICE"

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35



In this special machine there's plenty for you as a user of industrial lubricants. With the modern Refractometer, Sinclair Laboratory specialists keep posted on what's in your industrial lubricants. It shows them what properties to strengthen, so the finished product will perform best in any specific application.

Index of refraction and specific dispersion, determined by the Refractometer, is a measure of the chemical structure of lubricating oils. By use of such instruments as the Refractometer, Sinclair maintains important control points in the manufacture of dozens of industrial lubricants.

Such laboratory research and control gives you assurance that Sinclair lubricants are made correctly to provide the kind of special protection your valuable machinery requires.

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SINCLAIR REFINING COMPANY • 630 FIFTH AVENUE, NEW YORK 20, N. Y.

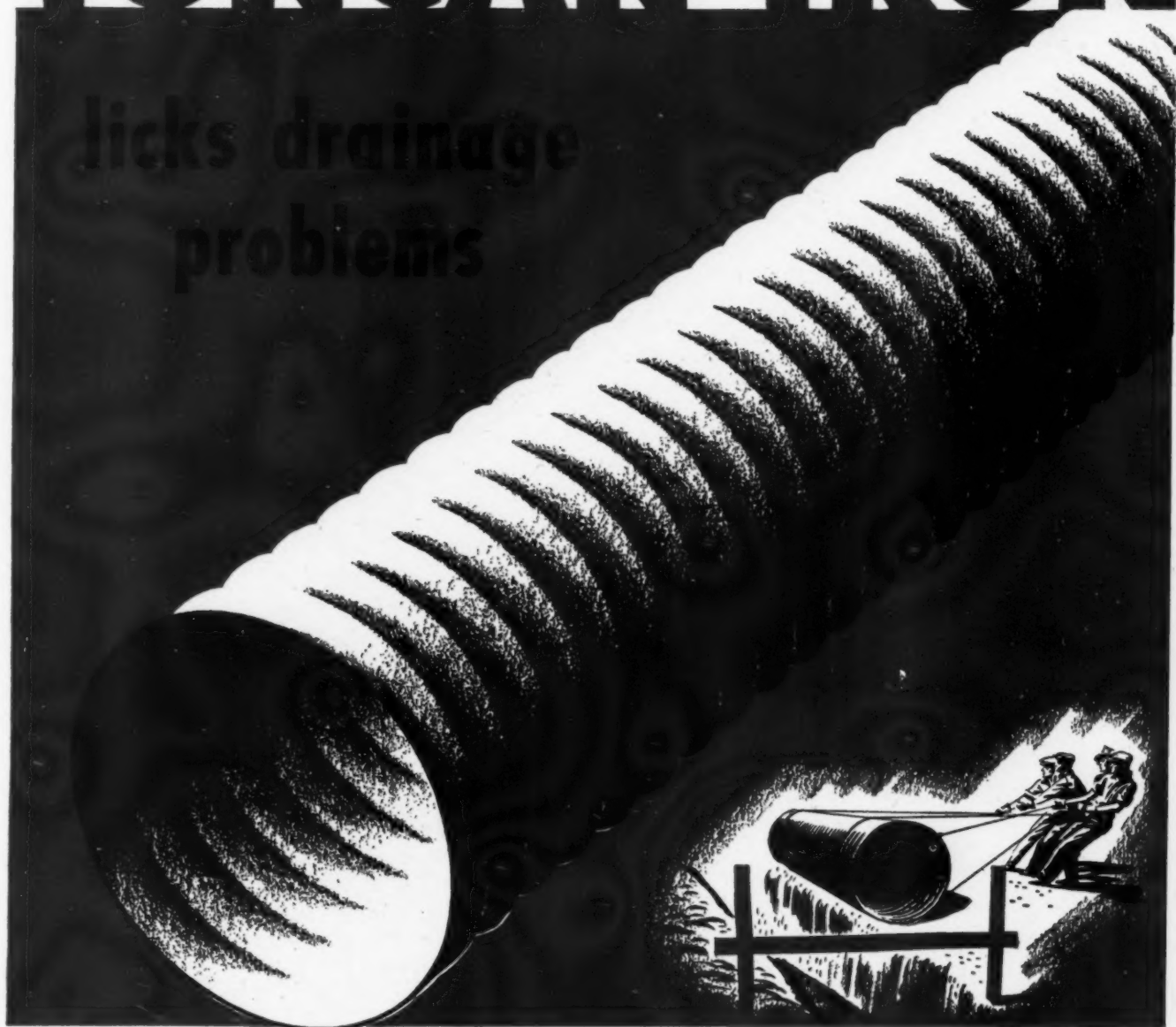
SINCLAIR
Lubricants for Industry

FINEST CRUDES + EXPERT RESEARCH

and MANUFACTURING CONTROL = OUTSTANDING PERFORMANCE

TONCAN IRON

licks drainage
problems



... because **TONCAN*** Iron Corrugated Metal Pipe ...



1. Is strong and flexible—carries tremendous loads without breaking or crumbling.
2. Resists vibration, impact, severe weather changes and settling earth or fill.
3. Is light in weight and remarkably easy to handle and install with unskilled labor.
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5. Resists rust and corrosion caused by water, soil or sewage.
6. Cuts installation and maintenance costs to rock bottom levels.
7. Lasts longer than the utility for which it is installed.
8. Is 100% salvageable. May be re-used without any loss.

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Toncan Iron — A Product of Republic Steel Corporation — is available in:

CORRUGATED METAL PIPE • PERFORATED CORRUGATED METAL PIPE • CORRUGATED METAL PIPE-ARCH • CORWEL SUBDRAINAGE PIPE
SECTIONAL PLATE PIPE • SECTIONAL PLATE ARCHES • SECTIONAL PLATE PIPE-ARCH • BITUMINOUS COATED AND PAVED PIPE

**What! Clear my roads
with FEWER trucks?**



**Yes! And do a better job,
at lower cost!**

MANY highway departments, using Walter Tractor Trucks, are doing just that. So can you. Here's why: With the great traction, power and speed of these specialized snow removal units, you clear more miles of road per hour—remove a greater volume of snow on each run—handle any snow conditions, from deep drifts to hard-packed snow and ice.

For example, Walter Snow Fighters maintain clearing speeds of 20-30 miles per hour. Snow is dispersed far to the side, leaving less snow to

be re-handled in widening out. A two-lane road can be cleared in one round trip, at high speed. With that kind of performance, it is easy to see why fewer Walter Snow Fighters do a bigger job of snow clearance—at lower cost per storm, with less traffic disruption and reduced maintenance expense.

This outstanding performance is made possible by the exclusive Walter Four-Point Positive Drive, which translates full engine power into powerful, non-slip traction. Models from 125 hp. to 350 hp., available with scientifically designed and properly mounted plows, blades, wings, center scrapers and sand and chemical spreaders for every condition. See your distributor—or write us for detailed literature.

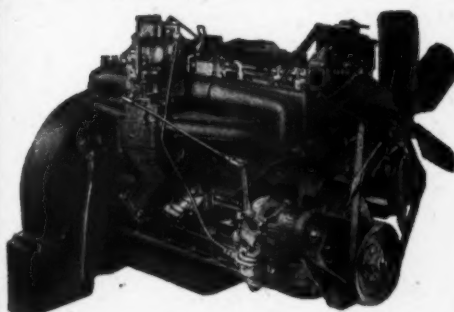


WALTER MOTOR TRUCK CO.

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**WALTER
SNOW FIGHTERS**

It Takes a Rugged Engine for the Tough Jobs



● This rugged Chrysler Industrial 12 Engine powers the husky shovel, shown below digging in for a big bite of anthracite coal.

CHRYSLER Industrial Engines are built for the tough jobs. They have proven their stamina—and economy, too—in shovels, cranes, pumps, tractors, motor coaches and many other applications.

Chrysler standards of precision, quality and performance have made these engines great. Their increasing popularity among industrial power users is proof of their ability to deliver dependable low cost power.

Superfinished parts, ease of servicing—coupled with nation-wide parts availability—assure powered-equipment operators maximum work hours.

Write the Chrysler Industrial Engine Division for help in solving your power problems.

Some Applications of Chrysler Industrial Power

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| ★ Arc Welders | Industrial Lift Trucks |
| ★ Air Compressors | Industrial Pumps |
| ★ Booster Pumps | Industrial Tractors |
| ★ Concrete Mixers | Mechanical Shovels |
| ★ Cranes | Motor Coaches |
| ★ Crane Carriers | Portable Sawmills |
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Horsepower with a Pedigree



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Please send the Chrysler Industrial Engine Catalog.

Name

Address

City State



**Heil Hydraulic Dump Units are
*mounted above
the truck frame***



- They don't interfere with other parts of the truck
- ... so • They are easier and more economical to install
- They are adaptable to any truck chassis

You give your profits a lift, when you use fast-dumping Heil Hydraulic Dump Units. They raise 24-ton loads to a 50° angle in 10 to 15 seconds. This dumping power and speed means more loads per truck and lower costs per yard.

Heil has made it easy for you to use these famous, fast-acting Dump Units—they are designed so that they are mounted above the frame. Thanks to this method of mounting, you can adapt these units to any truck chassis. Furthermore, you can shift them, if so desired, to compensate for odd wheel

bases, or to change the load on the rear axle to gain better traction during winter operation. This can be done easily and economically, without altering the chassis in any way. All the working parts are above the level of the frame. They do not interfere with any moving part of the truck. This feature is a great advantage, too, because it saves you time and money on truck maintenance.

Call on your Heil distributor and ask him to demonstrate the smooth, efficient speed of Heil Hydraulic Dumping Units. Look closely at the Heil Bodies. You won't see stronger, better-built jobs any place. Write for latest literature.

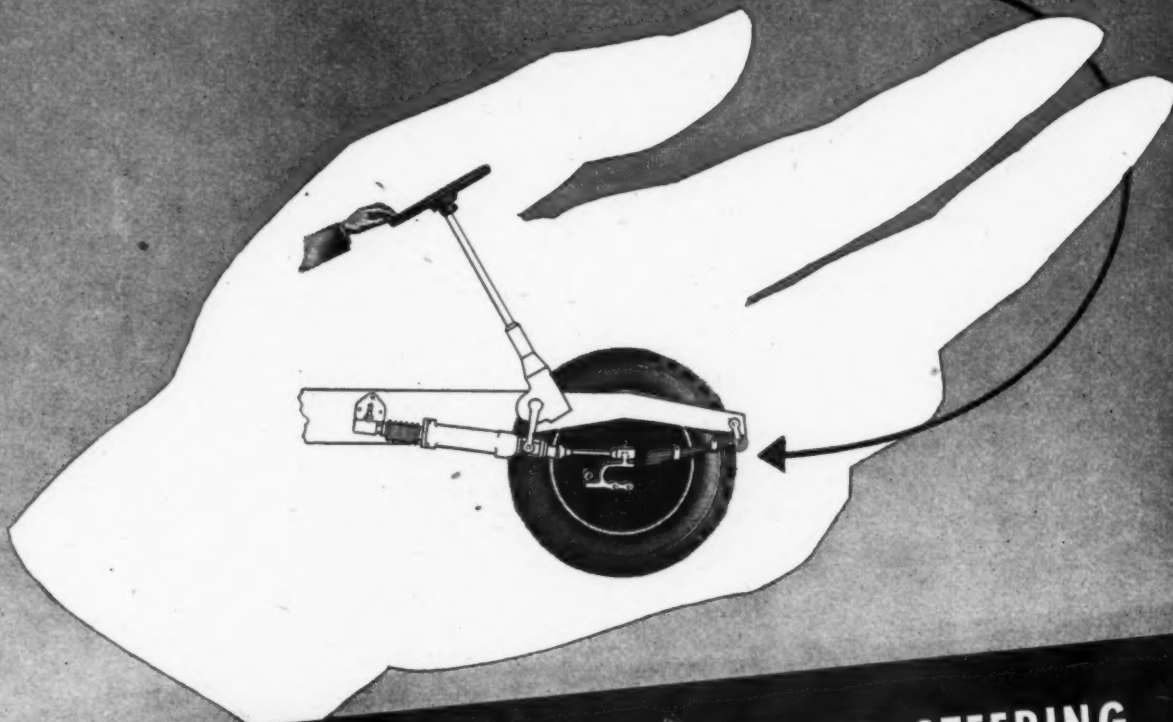


BN-124

THE HEIL CO.

GENERAL OFFICES • MILWAUKEE 1, WISCONSIN

INSTANTANEOUS FINGER-TIP RESPONSE



with VICKERS HYDRAULIC POWER STEERING

Two fingers on the steering wheel—it turns easily, and the front wheels of the heaviest truck or bus follow exactly. Vickers Hydraulic Power Steering does the work. And steering is just as easy over the roughest ground off the road as it is on smooth concrete. Road shock cannot be transmitted from the front wheels to the steering wheel or driver.

Steering is instantly responsive and firm—no rubbery feeling or wander. The driver is relieved of the

most exhausting part of his job, enabling him to get more done with less fatigue.

Vickers Hydraulic Power Steering has many other advantages: (1) requires minimum space and is applied to most existing hand steering mechanisms with a few simple alterations; (2) automatic protection against abuse and excessive steering reaction forces; (3) automatic lubrication; (4) 15 years of successful operating experience. Ask for Bulletin 44-30.

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REPRESENTATIVE APPLICATIONS OF VICKERS HYDRAULIC POWER STEERING

See those banks
breaking up
your roads?

Plan to eliminate this
spring road destruction
next year!

Here is a part of what is ahead on many of your roads. It's ahead of you right now—this spring. It is spring road damage—tax money—melting away because of the banks piled up through the winter by ordinary type plows.

Snogo can cut the cost of damage like this.

What you save in road repair cost annually with Snogo will pay its cost.

This has been demonstrated and proved repeatedly. When you have Snogo protection everything goes into the fields where it can do no damage.

No banks are piled up in ever narrowing, deepening lanes to drift back and block traffic and soak and soften road shoulders, endanger sub-grade or make secondary road into mud holes. Ditches will function normally and heaving and frost difficulties will be reduced.

Here is real snow clearance that pays dividends—Get the story now for next year—Remove your snow, don't just move it.



SNOGO

A SNOGO For
EVERY BUDGET

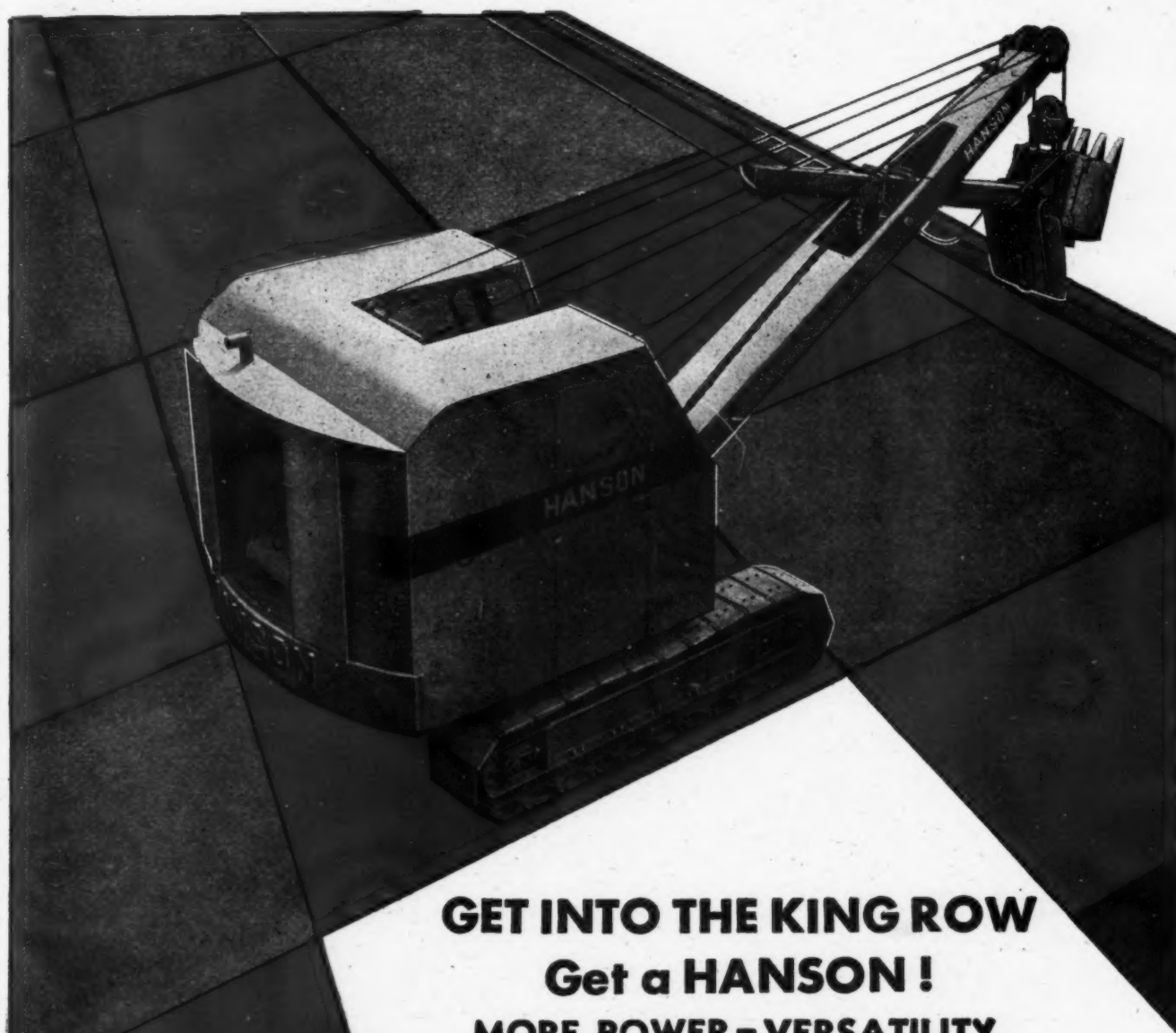
KLAUER MANUFACTURING COMPANY
DUBUQUE, IOWA

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GET INTO THE KING ROW Get a HANSON!

**MORE POWER - VERSATILITY
SPEED - ECONOMY**

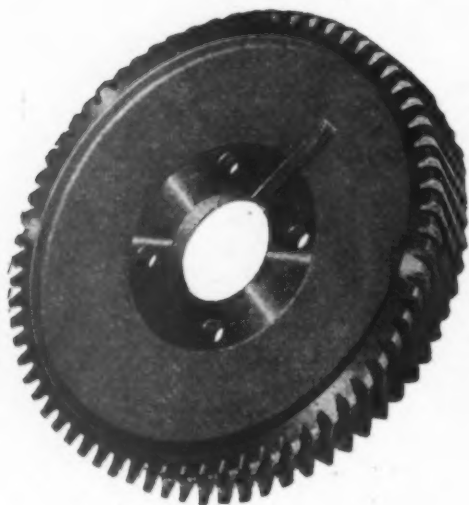
Compare these "KING-SIZE" features:

☛ Full-revolving ☛ chain crowd ☛ fully enclosed steel cab ☛ air controlled steering
☛ all-welded, steel construction ☛ disc type clutches on swing ☛ internal-expansion, booster-type clutches on hoist and crowd
☛ all clutches easily adjusted and relined without removing shaft assemblies ☛ extra long crawlers and low center of gravity
☛ speedy, versatile and rugged!

Shovel made in $\frac{3}{4}$ yd. and $\frac{1}{2}$ yd. sizes. Convertible to $4\frac{1}{2}$ ton and $6\frac{1}{2}$ ton cranes, respectively. Write for complete specifications, Dept. RS-27.

HANSON

**CLUTCH AND MACHINERY CO.
TIFFIN, OHIO**



This is a truck timing gear.

It is different from the timing gears in any other truck.

It is tetrapoid in form, for greater strength. It is drop-forged, case-hardened and generator-ground. It is made in our own shops.

We've been putting such timing gears in Mack trucks for 33 years. Not one of them has ever had to be replaced because of wear.

Every part that goes into a Mack truck is as honestly made, as thoughtfully designed for its own big or little job, as this unique timing gear.

That is what makes a Mack a precision-built truck and not a mass-production truck.

It is as simple as this: You get more work out of a Mack because we put more work into it.



Mack

since 1900, America's hardest-working truck

Mack Trucks, Inc., Empire State Building, New York 1, New York. Factories at Allentown, Pa.; Plainfield, N. J.; New Brunswick, N. J.; Long Island City, N. Y. Factory branches and dealers in all principal cities for service and parts. In Canada, Mack Trucks of Canada Ltd.

Trucks for every purpose

Moving half a million cubic yards of slag as fill, and for access roads to a new steel plant, this Model LJT dumper typifies Mack performance on construction jobs. A result of 47 years of heavy dump truck development, Mack ruggedness, flexibility and convenience in handling, tear down hauling costs as well as mountains.



the keenest buyers, the biggest
users, pick



The fast-growing Jaeger fleet of the Chicago Bridge & Iron Company, one of the biggest users of portable air compressors in the construction field, is typical of the preference for "AIR PLUS" Compressors among companies that know their air costs and buy on comprehensive tests and fleet performance data.

A few of many outstanding Jaeger users among contractors, utilities and industries are: Pennsylvania Railroad • Frederick Snare Corp. • Pacific Gas & Electric Co. • Shell Oil Co. • Eastern Asphalt Co. • Cincinnati Street Railway • A. J. Ellis Construction Co. • Gulf Bitulithic Co. • International Harvester Co. • Ford Motor Co. • Loesch & Green Construction Co. • Oliver Iron Mining Co. • A. B. Burton Co. • Clark & Runquist Co. • Northern Pacific Railroad • United Gas Corp. • Bechtel-McCone Corp. • Oklahoma Contracting Co. • Ditmars-Dickman Co. • Signal Pipe Line Co. • M. Hoeffkin Co. • Southern California Edison Co.

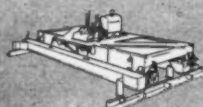


Back of every Jaeger Compressor is the most complete service in the construction field — tools, engines, compressors — sold, and serviced in 128 cities of the U.S. and Canada. Ask for Catalog JC-5 and name of your nearest Jaeger air station.

THE JAEGER MACHINE COMPANY, Columbus 16, Ohio

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"SPEEDLINE"
Concrete Mixers



"SURE PRIME"
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"DUAL-MIX" TRUCK MIXERS, AGITATORS — HOISTING
ENGINES, SELF-RAISING TOWERS — CONCRETE AND
BITUMINOUS PAVING EQUIPMENT

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INDUSTRIAL POWER



RTI Industrial Tractor—27 H.P. 104" Overall Length, 59" Overall Width Using Single Rear Wheels. 12' Turning Radius



UTI Industrial Tractor—49 H.P. 126" Overall Length. 76" Overall Width Using Single Rear Wheels. 16' Turning Radius



UTI Tractor With 22' Front End Lift

MM Industrial tractors are modern, economical, safe, and long lasting.

MM Industrial tractors are *BUILT TO DO THE WORK* and are designed so numerous worthwhile attachments may be easily and quickly added.

MM Industrial tractors and attachments simplify the problems of snow removal, lifting, loading, hauling, sweeping, and mowing.

There is economy in the initial price, operation, and maintenance by making possible all these operations in one basic unit.



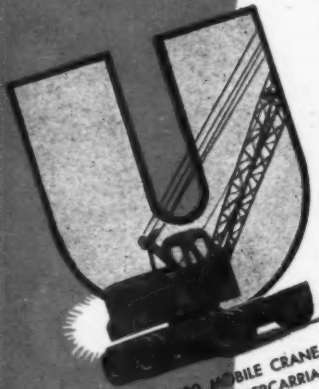
RTI Tractor operating front end broom attachment and towing a street flusher



RTI Tractor with shovel attachment

MINNEAPOLIS-MOLINE POWER IMPLEMENT COMPANY

MINNEAPOLIS 1, MINNESOTA, U. S. A.



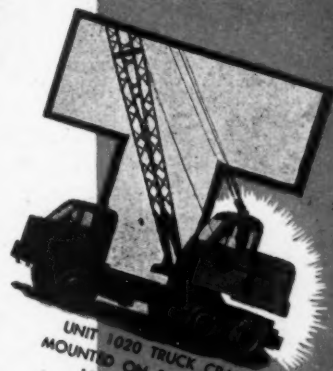
UNIT 1020 MOBILE CRANE
WITH 2 AXLE UNDERCARRIAGE
10 TON CAPACITY



UNIT 1020 MOBILE CRANE
WITH 2 AXLE UNDERCARRIAGE
10 TON CAPACITY



UNIT 357 MOBILE CRANE
WITH 2 AXLE UNDERCARRIAGE
5 TON CAPACITY



UNIT 1020 TRUCK CRANE
MOUNTED ON 3 AXLE TRUCK
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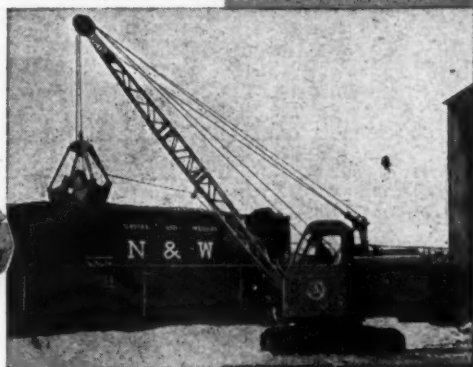
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1/2 AND 3/4 YD.
EXCAVATORS

5 TO 10 TON CRANES



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AUTOMATIC TRACTION BRAKES
STRAIGHT LINE ENGINE MOUNTING
ONE PIECE CAST GEAR CASE



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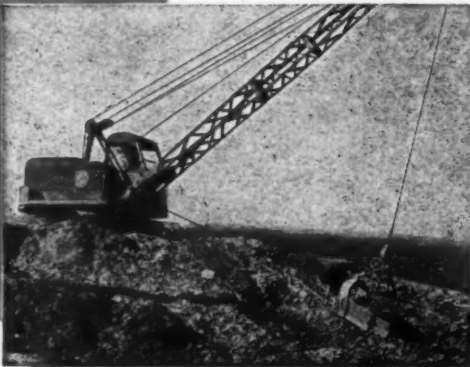
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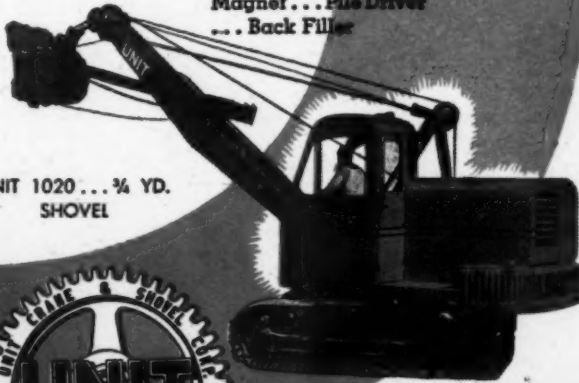
Full-Vision Cab .. ENABLES
OPERATOR TO SEE IN ALL DIRECTIONS

*Convertible TO ALL
ATTACHMENTS*

Shovel ... Clamshell
Dragline ... Trencher
Magnet ... Pile Driver
... Back Filler



UNIT 514 ... 1/2 YD.
DRAGLINE



UNIT 1020 ... 3/4 YD.
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UNIT CRANE & SHOVEL CORP.

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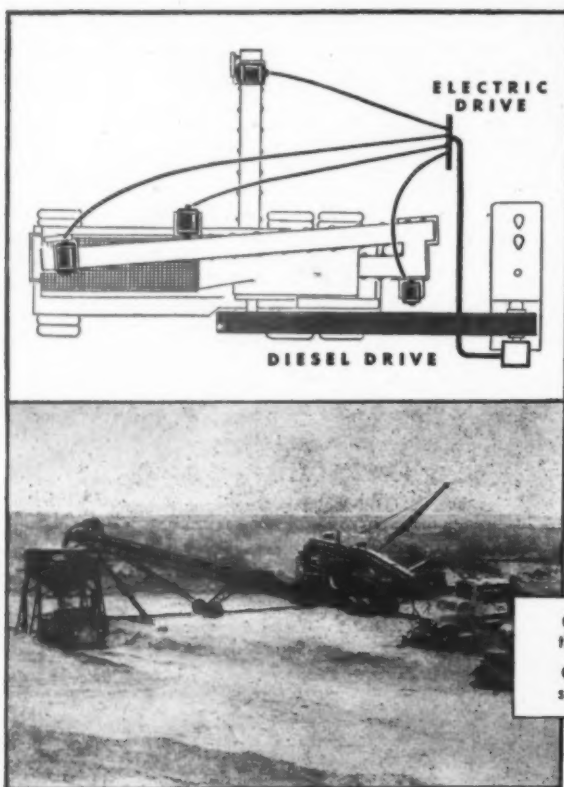
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NEW

CRUSHING AND SCREENING PLANT



WITH DIESEL AND ELECTRIC DRIVES

● Here's a high capacity plant that is more portable and requires less set-up time than other big plants.

One 125 HP continuous duty diesel unit powers the entire plant. A flat belt direct from the diesel unit drives the jaw crusher which powers the roll crusher through V-belts.

A 50 KVA generator mounted on the diesel unit furnishes electricity for the motors on the heavy duty screen and on each conveyor.

The screen is 3½ deck with bottom deck feed and top deck return. There are 96 square feet of specification screen for producing finished material. Stone chips can be produced as a by-product without extra equipment.

CONDENSED SPECIFICATIONS:

Jaw Crusher—10" x 36"	Delivery Conveyor—30" x 50'
Roll Crusher—40" x 22"	Moving height—12' 6"
Vibrator Screen—4' x 12', 3½ deck	Width—8'
Feeder Conveyor—30" x 50'	Moving weight (main unit)— 64,500 lbs.

Write for complete information about this big plant... built with extra margins of performance for extra profits.

- Generator mounted on diesel unit provides power for screen and conveyors through control panel. Crushers are driven by belt direct from diesel unit.
- A 46-VE on the job in Colorado. Pioneer Hydraulic Conveyor Trucks and the single diesel unit make it extremely portable unit.

PIONEER ENGINEERING WORKS
1515 CENTRAL AVENUE • MINNEAPOLIS 13, MINNESOTA

Engineers and
Manufacturers of
Quarry—Gravel
Bituminous and
Mining Machinery

PLAN WITH
Pioneer
ENGINEERING WORKS

WHEN EFFICIENCY MEANS PROFIT SPECIFY GAR WOOD

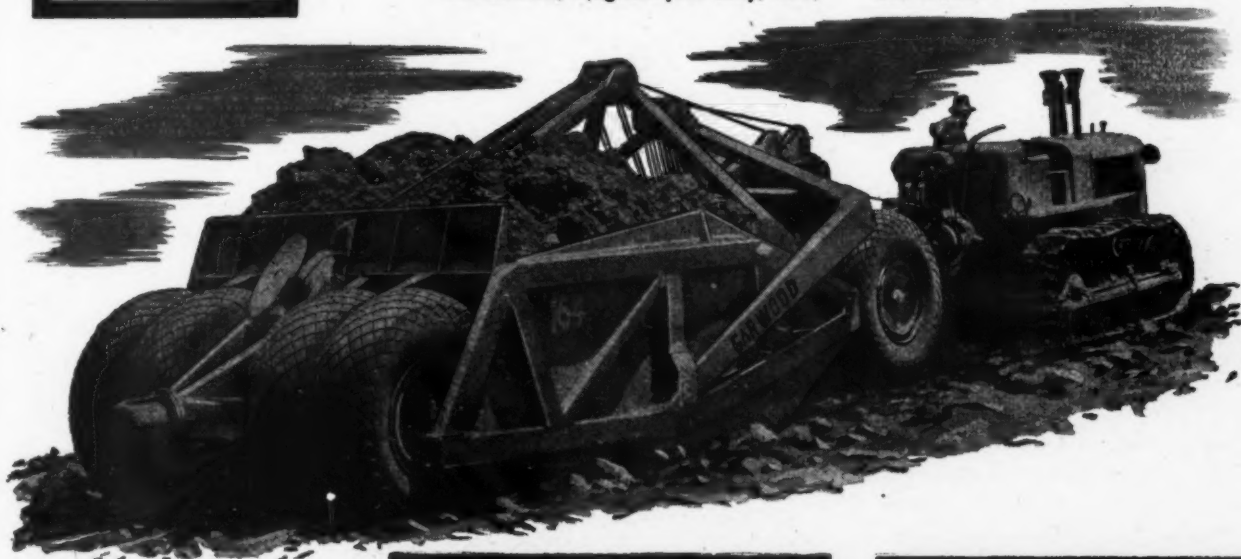
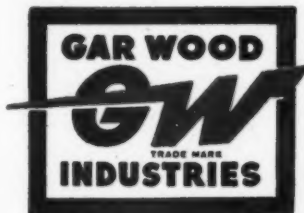
Wherever there's earth to be moved... clearing, leveling, grading, excavating... that's where power and efficiency are vital... because power and efficiency mean more work per day... more profit per job. And that's where Gar Wood comes in.

For every Gar Wood Bulldozer and Dozercaster is designed, engineered, and built for operating efficiency... with power to spare. Every Gar Wood Dozer and Dozercaster is built to make the nastiest, toughest jobs easy, safe,

and fast. And built with plenty of money-making muscle, plenty of guts... literally built to take a beating... thanks to Gar Wood down-to-earth engineering.

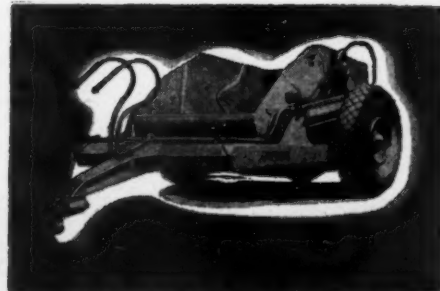
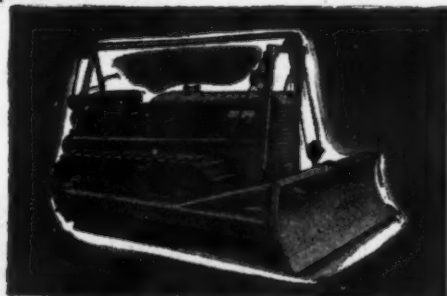
Want proof? Ask the contractors who rely on Gar Wood Dozers and Dozercasters on the job all over the world, year in and year out. Ask them for an honest appraisal of Gar Wood Road Machinery. Consider. Compare.

And then for your own good... specify Gar Wood!



Right - Gar Wood Cable Dozer

Far Right - Gar Wood 2 wheel hydraulic scrapper



ROAD MACHINERY DIVISION
WAYNE, MICHIGAN

HOIST & BODIES · HEATING UNITS · MOTOR BOATS · WINCHES & CRANES

DO YOUR ROAD MIXING
FOR AS LITTLE AS 1¢ PER SQUARE YARD
with the **SEAMAN MIXER**



Pocket size but packed with useful, practical facts,—the ever-popular "Soil Stabilization Methods,"—a book compiled by Seaman engineers. Yours on request.

Ask for Bulletin RS-25



While costs of operating any mixing equipment vary according to the character of mixed materials, local labor rates and several other factors,—nevertheless, under reasonable conditions, careful cost analyses have repeatedly shown that the motorized SEAMAN MIXER—Model MHD-72, produces a thorough, uniform and intimate mix for as low a cost as one cent per square yard. Even under adverse conditions costs generally do not exceed 5 cents . And with the SEAMAN MIXER, low-operating cost is coupled with high daily output. One Model MHD-72, operating in conjunction with a motor patrol, will mix 100 tons an hour,—or operating with a 100 ton conventional travel plant, will double that capacity. Calculated on the basis of square yards,—the SEAMAN MIXER can be counted on for 5000 square yards in an eight hour day, in fact, under good operating conditions, Model MHD-72's have repeatedly turned out over 9000 square yards in 8 hours . . . What's more,—SEAMAN MIXERS represent a surprisingly small investment. Prices start as low as \$869.00 F.O.B. Milwaukee.

SEAMAN MOTORS, INC.

305 NORTH 25th STREET



Announcing - **NEW MODELS** **INTERNATIONAL TRUCKS**

Truck owners will operate them—drivers will drive them—with greater pride than ever before.

They're the new KB Models of International Trucks—outstanding products of advanced design, engineering and research—newly styled with flowing lines sharply accented by gleaming chrome, and with 95 features and improvements variously incorporated throughout 15 basic models.

And fully qualified to do their jobs with new economy, new ease of operation, and the rugged stamina for which Internationals are famous!

They're the finest values in more than 40 years of International Truck history. And International values have always been outstanding—so outstanding that for 16 years more

heavy-duty Internationals have served American commerce and industry than any other make.

In the complete International Line there's the right truck for every hauling job. And back of every truck is specialized International Service—supplied by the nation's largest company-owned truck-service organization, International Branches—and by International Dealers everywhere.

Yes, the new KB Internationals will be owned and driven with pride—with pride and profit—because these rugged trucks perform with unbeatable economy.

TRUCK OPERATORS!
For details of the 95 FEATURES AND IMPROVEMENTS in various models of the new KB Internationals, see your International Branch or Dealer.

Motor Truck Division

INTERNATIONAL HARVESTER COMPANY
180 North Michigan Avenue, Chicago 1, Ill.



Tune in James Melton on "Harvest of Stars" every Sunday!
NBC Network. See newspapers for time and station.



INTERNATIONAL Trucks

When writing advertisers please mention —> ROADS AND STREETS, February, 1947

*What's
missing
in this
picture?*



Thousands of dollars for this Crane —but it can't work!

● This crane erected on the job cost \$41,000. But it can't do a nickel's worth of work until rigged with wire rope costing a fraction of that amount.

The wire rope used makes a big difference, yet for this job Preformed Wire Rope of Improved Plow Steel . . . the best there is . . . costs only about \$300.

Preformed permits faster, better work, with fewer shutdowns.

Management likes Preformed because it lasts longer. Workmen like it because it's easier and safer to handle. Get the most out of your machines by specifying Preformed of Improved Plow Steel.

SEND FOR FREE COPY of informative book about Preformed. Address: Preformed Wire Rope Information Bureau, 520 N. Michigan Ave., Chicago 11.

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HANDLES EASIER - LASTS LONGER



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The Rock-Drilling Record

FEBRUARY, 1947

VOL. I.

LE ROI COMPANY ACQUIRES CLEVELAND ROCK DRILL CO.

Nation-wide Service Facilities



New Era of Highway and Public Works Construction Forecast

Le Roi's Cleveland Division meets the challenge by designing and producing a line of easier-holding, faster-drilling, more dependable machines that greatly reduce rock-drilling costs.

New Rock-Drilling Combination Reduces Costs

Popular AIRMASTER series of portable compressors now teamed with a complete line of hard-hitting, fast-drilling tools.

Utilities Speed Repair Work with Air Tools

Equipped with mobile, truck-mounted Le Roi AIRMASTER compressors, crews rush out to repair the ravages of winter weather. Using hard-hitting Cleveland

Quarry Production Up

Increased demand for stone met by wise use of modern rock-drilling equipment. Unusual flexibility of Cleveland wagon drill responsible for establishing new daily footage records. Ample power

Production of Critically Needed Lead Aided by Cleveland Rock Drills

Rotation strength, easy-holding and dependability of these tools key factors in increasing tonnage per miner. The men say that they like to use Cleveland Drills. Reports show that miners drill more feet of hole and are less tired at the end of the shift.



A leader in portable air power and a leader in rock-drilling equipment join to give you new standards of rock-drill service and performance

Service

We are emphasizing prompt, efficient service because it is a basic Le Roi policy. It is so important to us that no one holds a Le Roi franchise who doesn't conform to our rigid requirements. Nation-wide, Le Roi service is handled by well-trained, experienced, and competent men. All service outlets are conveniently located to assure you of speedy attention.

Performance

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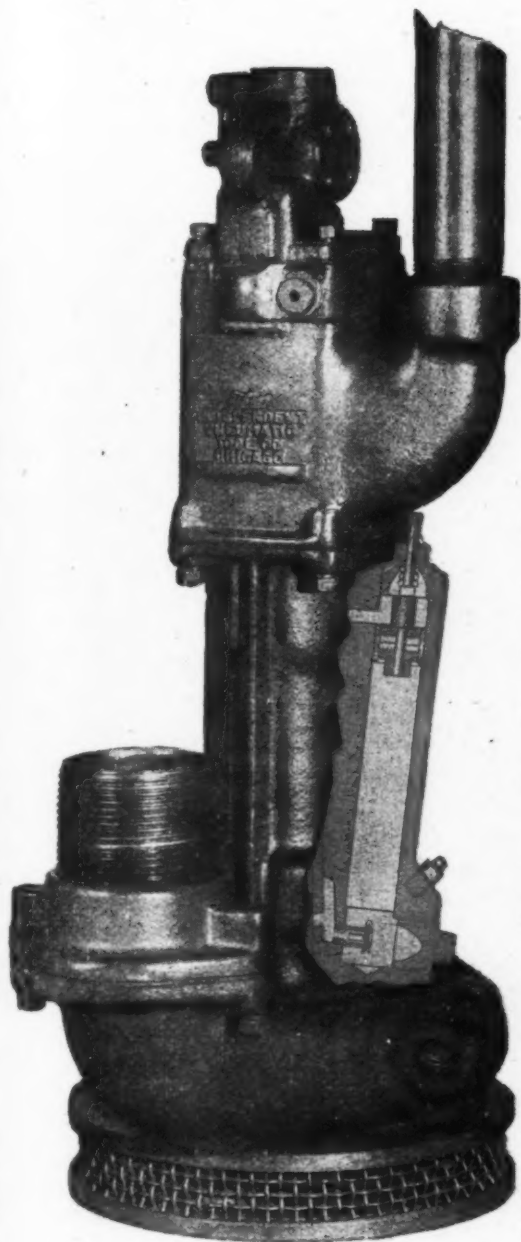
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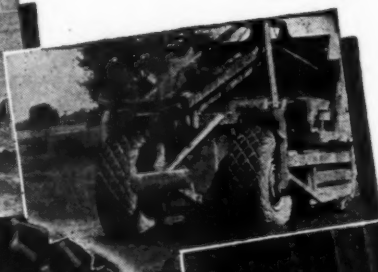
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Significant Changes in Modern Bridge Design

Many spans on highways throughout the country will be reconstructed or replaced to eliminate traffic "bottlenecks"

By Raymond Archibald

Chief of Bridge Division
Public Roads Administration,
Washington, D. C.

MODERNIZATION of the nation's highways to meet present and future traffic needs will require changes in the character of highway bridges as striking as the changes that will be made in roadway design.

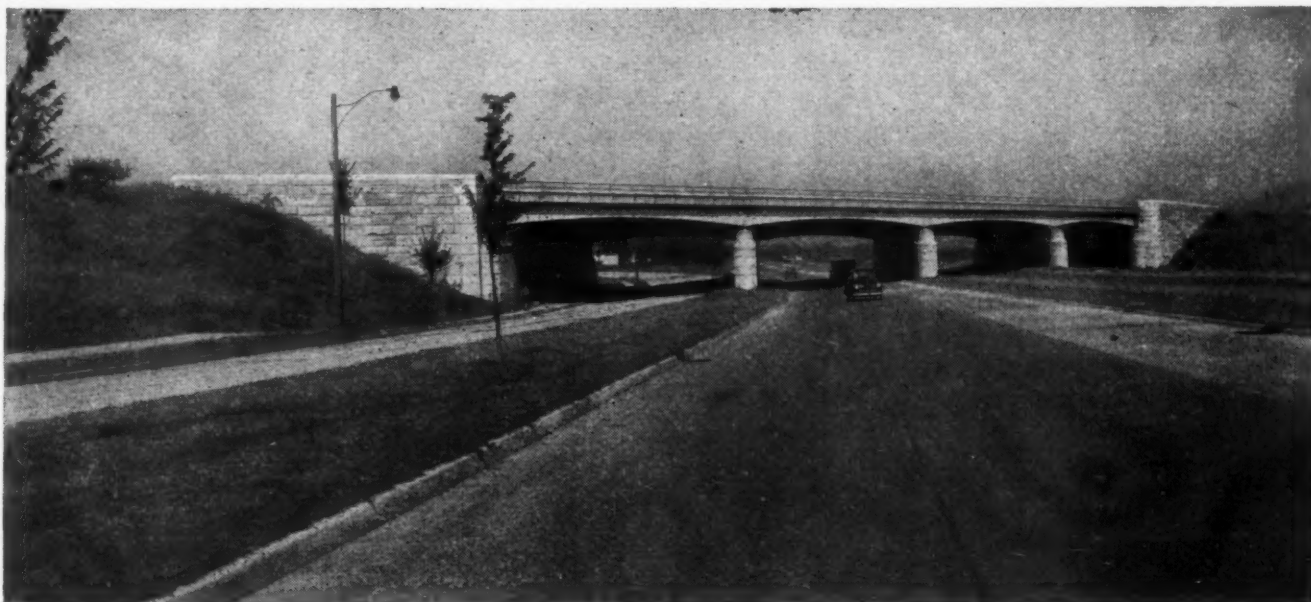
During the next three or four years

state highway departments will construct hundreds of miles of 4-lane and 6-lane express highways to enable traffic to flow freely along heavily traveled routes in metropolitan areas. These urban expressways will be incorporated in the proposed National Interstate Highway system, the routes of which already have been designated by a majority of the states.

At the same time rural sections of the 40,000-mile Interstate system and

many roads not included in the system will be improved to accommodate increased volumes of traffic. Many of the improvements will be multiple-lane highways.

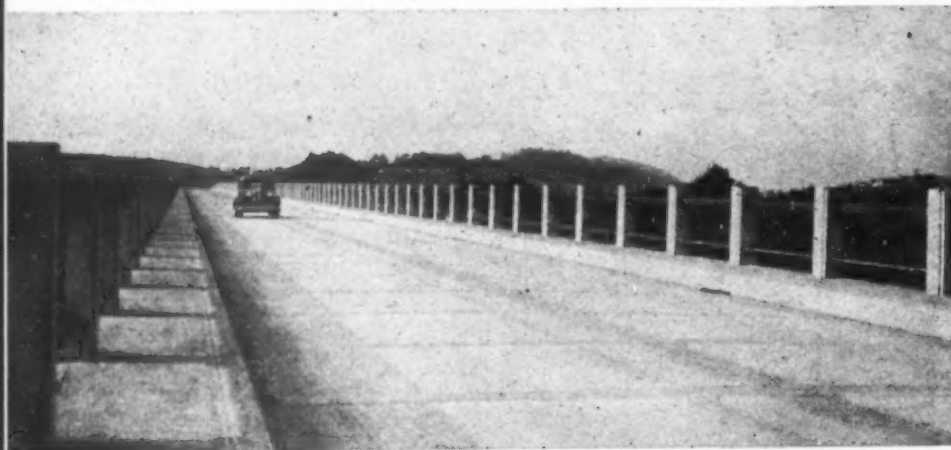
From the point of view of the average motorist, who usually ignores engineering details but wants to "get where he's going" as quickly as he can without too much risk or inconvenience, these highways of the future, with their wider pavements and



★ Underpasses are now built with wide clearances and continuous separation strips



★ Beauty and durability were combined in the design of this bridge in Glacier National Park



★ Wide pavement and strong railings set back from the curb are desirable in bridge construction

smoother surfaces, will be of limited service to the traveling public unless the bridges they cross are designed to facilitate the movement of traffic in-

This timely article touches on numerous phases of bridge design. May we add a bit of emphasis of our own on the safety side, with the note that the old hazard of rickety bridges collapsing under load, while still an occasional danger, has lost the spotlight to a far more prevalent hazard: the danger due to inadequate width and faulty approaches. A report of an investigation on the pattern of vehicles on the roadway at bridges was heard with interest at the recent Highway Research Board meeting.

Meanwhile scores of collisions on bridges continue to make the nation's headlines, involving not just small bridges but some of our great monumental structures such as the San Francisco Bay Bridge where six-lane jam-packed high-speed traffic has no center separation.—*Editors.*

stead of restricting it.

In the early decades of the Federal-aid highway program, bridge design lagged behind progress in other branches of highway engineering. Narrow bridges with cumbersome superstructures and roadways less than the width of the adjacent road surface were built on main highways. These structures slowed down traffic and contributed to the hazards of driving, particularly at points where heavy streams of traffic converged upon cities.

Apparently the bridge engineer's objective, in those days, was merely to provide a means for traffic to cross a stream or a depression too deep to be filled. Undoubtedly he perceived that bridges should be designed as an integral part of the highway in order to permit the continuous flow of traffic, but lack of funds prevented applying such conceptions.

In recent years the field of the bridge engineer has constantly expanded, and the principles of bridge design have changed radically. This has come about largely because it has been necessary to build wider and stronger spans across streams to accommodate the steadily increasing volumes of traffic on rural highways, and because of the great increase in the

number of structures required for the separation of grades at highway intersections, railroad crossings, and on urban projects. Today a capable bridge designer must be familiar with the principles of architectural design, flow of traffic, and highway safety measures as well as sound engineering practices.

Hundreds of narrow, obsolete bridges throughout the country are still in use, but many of these will be replaced in the near future by structures conforming to modern standards of bridge design.

In preparation for the huge highway construction program authorized by the Federal-aid Act of 1944, bridge engineers of the Public Roads Administration, working independently and in co-operation with the American Association of State Highway Officials and other national organizations, have conducted special studies to develop the best practices in bridge design.

Standards for traffic capacity, load capacity, the various physical factors that affect the movement of traffic, and the pleasing appearance of structures, have been carefully considered in an effort to provide for the safe and free movement of vehicles over bridges. The principles adopted are being applied in the bridge work of the Federal-aid program.

An intensive study of bridge railings has led to the use of wider curbs and streamlined railings of greater strength.

The use of median strips to separate traffic moving in opposite directions is recommended for important structures.

Safety requires that the *full width of roadway (surface and shoulders) extend through short bridges.*

When a section of highway is to be widened, it is dangerous to retain any bridge having a roadway width less than that of the widened surface.

Deficient structures should be widened or replaced by new bridges. Generally speaking, new bridges should be designed to permit traffic to pass over rather than through the structure.

Particular attention has been given to the horizontal clearance of vehicles at underpasses. Current designs provide greater clearance with sidewalls and center piers than has been customary in the past.

It is important that traffic hazards be eliminated on approaches to bridges. Improvements have been made in the arrangement of ends of curbs, walks and railings.

The use of welding on steel bridges is increasing. This practice is advocated when the latest methods of de-

sign and workmanship are employed, but it is well to remember that rigid inspection is necessary on welding jobs.

Continuous spans are being utilized more than ever before in bridge designs. This is a type of construction in which the trusses or girders are continuous for two or more span lengths, instead of using simple or separate span lengths between each pair of supports. This type of construction usually is more economical, as it requires less material. It has the further advantage of eliminating expansion joints—the bane of the maintenance engineer—and providing a smoother roadbed, thus contributing to the comforts of driving.

In designing bridges, use of the standard H-20 load capacity advocated by the American Association of State Highway Officials has been quite general in the past, but the new H20-S16 load capacity is being adopted for bridges that probably will be included in the National Interstate Highway system. There is a trend toward the use of greater load capacity in the design of bridges on all highways.

Good architectural treatment of large structures is being encouraged, especially where improvement can be made without much increase in cost. State highway departments are employing consulting engineers and architects to an increasing extent, particularly for major bridges in urban areas.

Bridge designers have profited from the experience gained during the war, when circumstances often made it necessary for bridge builders to depart from conventional standards and improvise a bridge "on the spot." New materials and new methods of design developed during the war years have been adapted successfully to peacetime construction.

Bridge design is now recognized as one of the most important phases of highway engineering, and no crystal gazing is necessary to predict that bridges built in the future will be stronger, wider, and safer than most of the spans constructed in the past.

One of our readers, Allan F. Osberg, residing in Brookline, Massachusetts, of all places, has reminded us that probably the longest stretch of road in any one county in this country is that of US 89 in Coconino County, Arizona—about 250-mi. This exceeds even that covered by US 66 in San Bernardino County, California, and certainly beats the 107 mi. in Pecos County, Texas, described by Mack Hodges, of the Texas Highway Department, in our December issue.



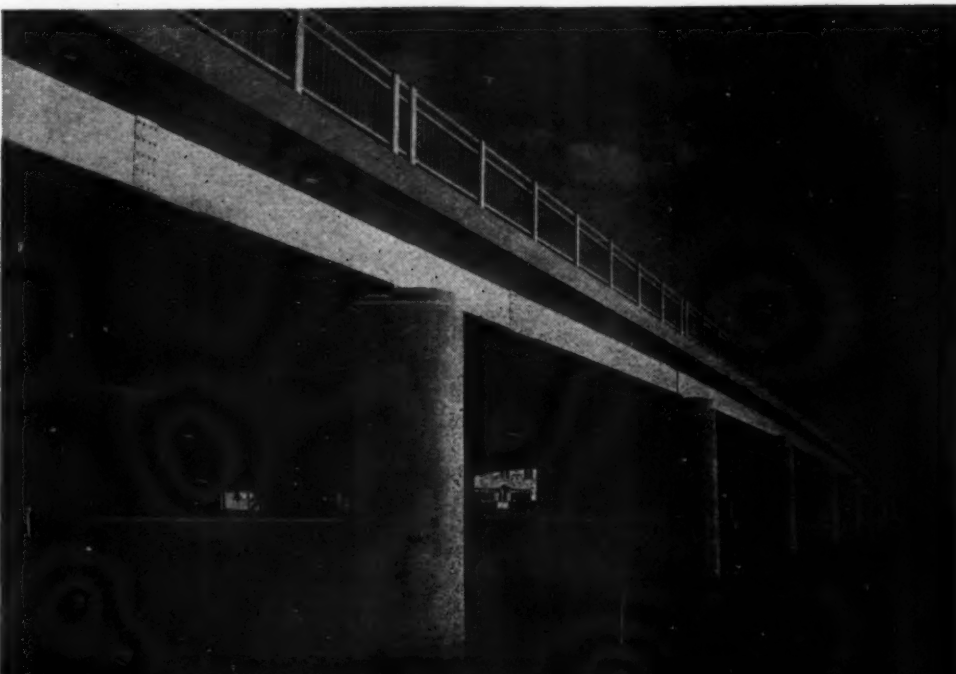
Photo by Acme

★ Heavy truck was the straw that broke the camel's back, in this case an eight-ton-load-limit bridge in California. Thousands of dangerously weak bridges await reconstruction



★ Thirty years ago motorists risked their lives on wooden bridges like this one. Picture was taken in Sevier County, Arkansas, in 1917

★ The Fox River Bridge at Johnsburg, Illinois, conforms to modern standards



★ We're Betting Them Across the Board

Just about a year ago, we stated our preference of horses in the belated race for postwar prosperity. We still want to place our money on Supply, Demand, and Competition. The recent election returns are currently being interpreted as a mandate from the American people that they would also like a chance to bet on these thoroughbreds, free to do their best without a crippling weight of handicapping restrictions. Controls are practically off—the race we hung around so long to see is ready to start. We are so excited, we can hardly wait!

Nevertheless, we want to give the men that industry chooses to ride these mounts a word of friendly advice. They are getting a somewhere nearly even break now only because the stewards couldn't help themselves. These folks don't like them any better than they ever did. All they want is any lame excuse to slap all that extra weight right back on them.

We hope, for heaven's sake, our jockeys don't try any funny stuff and that they will be satisfied with a fair profit. We would like to see the trainers, stable boys and all labor, share fairly in the unprecedented prosperity which can result. The American people are expecting the best the entire stable has in the way of efficient production, planned on a long-range humanitarian basis. They are trusting free enterprise to take care of veterans' housing, without having to be forced to do so. Thinking of America first will pay by far the biggest dividends.

On the other hand, if industry muffs this opportunity it may very well never get another chance to carry on in the American tradition. There are plenty of people willing to bet that the time is too late right now for it to win. Anyhow, it won't pay to underestimate the well-entrenched subversive elements reported to be working day and night to gain their communistic ends. The issues are confused. Subsidies, innuendo, and half-truths have left so many of this country's solid citizenry in a state of confusion that nothing short of a clear-cut decisive victory will prove conclusively

to them that progress can go hand-in-hand with free enterprise. This race simply must not be anywhere near a photo-finish—there will be another one coming up in a couple years. It must be remembered too that since these horses were barred from the track a dozen or so years ago, they are apt to be somewhat out of practice by now and not in prime condition. They will probably need special handling. And then again, we recall that

some of those old-fashioned tactics helped to get them barred in the first place. We know industry is aware of all these things. We are just counting on it so strong for that new car and house, and those safe highways and all those things we dreamed of in this postwar era that we cannot help calling their attention to the hazards.

We are shooting the works—our money is on the nose!

—H. K. Glidden.

★ Mechanize Concrete Patching

A lively discussion of the economics of concrete pavement patching took place at the recent research meeting. Admitted by all was a lack of analysis to support decisions as to when to begin patching, how extensively to patch, and so on. It was pointed out that patching is costly. Of course it is, considering the hand methods and tinkering that often go on in connection. Surely some of our resourceful contractors and their mechanics, if not the maintenance and equipment departments of the highway departments, can come along with rigs that will cut the hand labor involved, speed up the work, and result in lower unit costs. A sawing device for making clean-edged weakened-plane cleavages part way down, so that hammers can do, for example, the rest. A bat-

tery of jackhammers mounted so they can be mechanically spotted over a given area, for another. A small mixer-screed-vibrator outfit to do the concreting. Or maybe we're slightly nutty this morning.

It is hard to understand some of the psychology shown toward concrete roads that have become worn. Horses get old and so do pavements, and it makes good sense to do everything possible to prolong a useful old age to the economic limit. Certainly more states can do more systematic patching of still-sound pavements than have seen fit to do so, and give more attention to field methods that will bring the cost down and less thought to hasty, wholesale and expensive covering up.

★ More Horsepower to You in '47

Equipment makers marked time a bit on new models during the first year after V-J day but exciting developments are in prospect in 1947. Watch particularly for more power and speed and traction in earth-moving equipment. It's on the way, and with it will come a new pace on road and airport jobs, a pace which will become a normal one, accomplished smoothly and without the frenzied

waste effort that went along with the fast pace on war jobs. And look for lower unit costs with respect to other construction cost indices. All this of course assuming that construction workers will once again do an old fashioned day's work in this land of promise, and industrial production will settle down so that road machinery makers can really roll.

★ Getting More Pay for Engineers

At the recent AGC meeting in Chicago contractors were shown that they have a real and immediate personal stake in the struggle of highway departments to build efficient postwar organizations. Hal Hale, AASHO's executive secretary, who talked straight from the shoulder to an audience of highway contractors, reminded them that no engineers means no construction plans, and no plans means no lettings. It's that simple. And all over the country today you see empty drafting rooms because young engineers returned from military service have gone into industry or elsewhere for better money than the straight-jacketed highway departments are empowered to offer these young fellows.

In discussing the situation, Mr. Hale paid tribute to the hundreds of veteran highway employees who have made careers in the service and are responsible for the splendid record of highway development in this country. Over eight hundred of them have received 25-year buttons from AASHO for meritorious service. These men will be retiring soon in increasing numbers, and who will take their places on the junior rungs of the ladder?

Sam Hadden, ex-president of AASHO and now chairman of the Highway Research Board Committee on Organization, rose at this point in the discussion and put it up to contractors to help bring about salary betterments in their respective states. There is a division of opinion as to whether a highway department should or should not fight its own fight unaided. But the fact remains

that local contractors' associations can and should swing their weight on this problem. Contractors are men of influence and individually or collectively can be a big help in awakening legislatures to the necessary legal action. It is thoroughly in the public interest, and a cause which usually will require no increases in general taxation.

Meantime, a highway committee is seeking to bring about an eventual

standardization of engineer titles and responsibilities, which is a crazy quilt pattern among the states. But that will take several years. Action—now, in 1947—is imperative. As Mr. Hadden pointed out, a legislative sanction of a horizontal pay raise for state highway employees was once achieved in a single day in Indiana. There is your precedent for similar action in your state.

★ Urban Right-of-Way Financing

Highway revenues for construction, bond issue proceeds for financing the formidable land acquisition costs—that is the sound procedure for metropolitan expressways, said PRA Commissioner Thos. H. MacDonald at the recent annual AGC convention.

Here is one of the most important utterances of the winter in the highway business, and it came from a leader whose broad-visioned thinking at national meetings recently has been such that, if heeded, it will be felt in the form of sound highway development for decades to come.

Cities need expressways so badly that they are worth almost any cost—like the three thousand dollar operation that nicks you like hell but enables you to go on living and having something out of life. Half of the cost, often more, must go to buying and clearing a wide swath of land, with plenty of emphasis on the word wide, as is to be seen on some so-called expressways that today are

obsolete before their time for lack of width.

The strategic importance of the limited access highway is shown by fact that one such dual 24-ft. highway has the traffic capacity of five 40-ft. paved streets of ordinary arterial design, and in exceptionally favorable circumstances may be the equal of no less than eight 54-ft. streets!

The Commissioner based his remarks on the Indianapolis plan under which the city is to float bonds to finance right-of-way purchase for any civic need, such as new schools, parks, arterials, etc. The bonds are to be supported by a property tax. Bonds for this use will attract investors on a 30-year basis at low interest rates because of the inherent safety of the proposition. For much of the land involved is either blighted now, or is heading toward that fate, and hence well planned and designed public works will almost inevitably bring a betterment in land values.

Outstanding Program Planned for American Road Builders

*(To be reported on in detail in March
ROADS AND STREETS)*

The old prewar swing, adapted to the tremendous national highway rehabilitation task ahead, plus major attention to airport problems—that in a nutshell describes the program of the 44th annual meeting of the American Road Builders' Association, Feb. 17-20 at the Palmer House, Chicago.

Among the headlined speakers announced by Engineer-Director Chas. M. Upham are Maj. Gen. Philip M. Fleming, Administrator, Federal Works Agency; Thos. H. MacDonald, Commissioner of Public Roads; H. A.

Hook, Asst. Administrator for Airports, Civil Aeronautics Administration; C. W. Phillips, President, American Association of State Highway Officials; and other national leaders.

Seventeen technical committees will meet Sunday, Feb. 16, prior to the general sessions—on subjects which include alignment, grade, and right-of-way; conservation of highway revenues; elevated and depressed highways; express highways; grade separations; radio communications; highway equipment; mass transportation; soil compaction; highway safety; treatment of icy pavements; construction practice education; granular stabilization; soil-cement; asphalt and tar stabilization.

A feature of the convention is the Monday morning Town Hall Meeting

on Airports, in which a panel of 33 authorities will each devote a few moments to a zip-zip question-answer treatment of problems in airfield design and construction. The subjects planned are: concrete runways; methods for making airports self-sustaining, advantage of funneling federal-aid through state aviation agencies; slag-sand binder for airports; airport terminal buildings and hangars; design and construction of tar pavements for airports; the need for a freeway-type of highway from airports to center of cities; regular maintenance of airports.

Airport snow removal; airport terminal buildings and hangar-shop design and layout; radiant heat for snow removal; airport markings; as-

(Continued on page 117)



★ The haul road at S. F. airport—paved 40 ft. wide with heavy asphaltic concrete over 3 ft. of stone base, this road was designed for 40-mph. operation and has carried about 5000 passages daily of trucks weighing up to 70 tons gross

80-Wagon Fleet Moves Million Yards per Month

- 3.5-mile half-million-dollar private haul road a feature of Macco-Morrison & Knudsen airport job at San Francisco.

- New-type high-speed 33-yd. wagons a factor in 50,000 c.y. peak daily production.

- Made-land project involves skillful displacement of under-water bay mud

By Harold J. McKeever
Editor, ROADS AND STREETS

SOUTH of San Francisco there is a privately built highway that's the damndest thing you ever saw.

Over its 3.5-mile length, night and day, roars a fleet of earth wagons—65 or so always on deck—their begoggled drivers tailing each other through the dust with such enthusiasm that 45,000 to 50,000 c.y. is just another day's run.

Its 3 ft. thickness of select material rock and heavy asphaltic concrete pavement takes a beating from 2,500 round trips daily, by wagons too heavy empty to be permitted on a

public highway—wagons that weigh up to 140,000 lb. each with heaped pay load.

The road in question is to be seen at the new San Francisco International Airport, fifteen miles south of the city, where a 320 acre fill is being built out into the Bay under the city's \$20,000,000 bond issue program. The highway was built in 1944 by Macco Corporation and Morrison-Knudsen Company, Inc., joint contractors, who that year began an extensive filling of the field for the Army engineers. The contractors moved 2,700,000 c.y. in '44 and 300,000 c.y. clean-up work in '45. Armed with this haulway, plus an extensive mountain-top pit

and other on-the-ground facilities, the contractors were successful bidders on a 6,000,000 c.y. airport grading contract let in May, 1946, under the city's new program. And they were \$300,000 low on a \$3,000,000 state highway contract awarded in October, 1946, for a 5.1-mile section of the relocated Bayshore expressway which will skirt the expanded field.

Earth moving operations on the airfield contract were 82% completed by Dec. 1. This feat was accomplished by moving 750,000 c.y. first 60 days after the award; 1,045,000, 1,027,000 and 1,022,000 c.y., respectively, in August, September and October; and 450,000 during rainy November. The

airport contract stipulated 820,000 c.y. in first 60 days and 820,000 c.y. monthly thereafter.

During October and November the contractors also made a 10% beginning on the 500,000 c.y. of roadway excavation, 3,000,000 tons of borrow and other phases of the highway contract.

12,000,000 in Ultimate Airfield

First, to describe the airport plan and program briefly. Like other metropolitan port cities, San Francisco has seen the need for a real modern air terminal capable of serving world air transport. Three months after the close of the war, citizens voted bonds to finance expansion of the present field, which in spite of enlargement during Army use is currently swamped by expanding traffic.

Under a Master Plan the San Francisco International Airport will require 12,000,000 c.y. of placement to make new land and raise portions of the existing field. Paving is planned for 120,000 lb. planes. There will be two pairs of twin or parallel runways, 7750 ft. for take-off (prevailing wind) and 6,000 ft. for landing one of the longer runways comprising an extension of the present 6,000-ft. prevailing wind runway. Connecting taxiways, aprons, access roads, field drainage, drainage control, and terminal facilities are planned for the layout tentatively projected on the accompanying map.

The first or 6,000,000 c.y. contract of last May was for filling in and



★ Six-yard electric shovel working under a 240-ft. slope of loose earth

raising 320 acres, and grading two new parallel runways and connecting taxiways. This contract also will involve certain 10-inch. thick concrete runway and 11-in. concrete taxiway paving on older consolidated ground, and pavements on new higher ground consisting of 10 or 12 in. of crushed stone base and 3-in. of hot-mix asphaltic concrete.

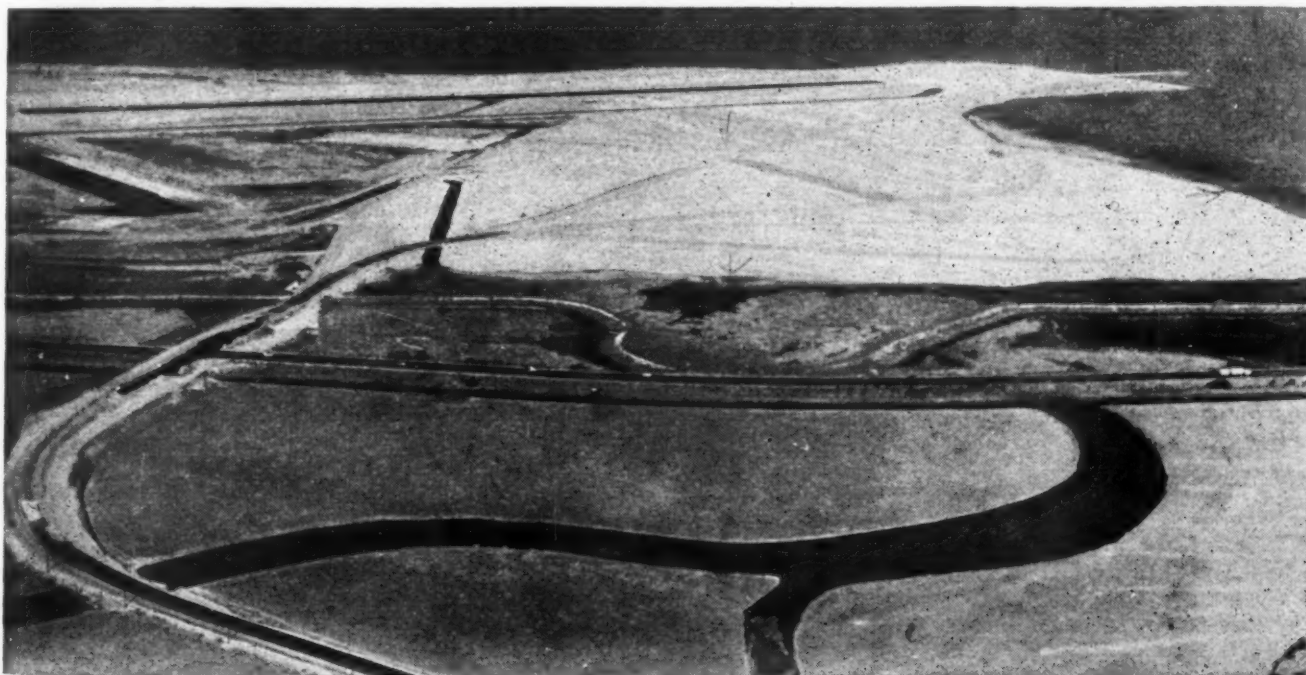
Runways are to be paved 200 ft. wide, with 25-ft. shoulders; taxiways 75 ft. wide, with 5-ft. shoulders.

Pit Has 240-Ft. Face

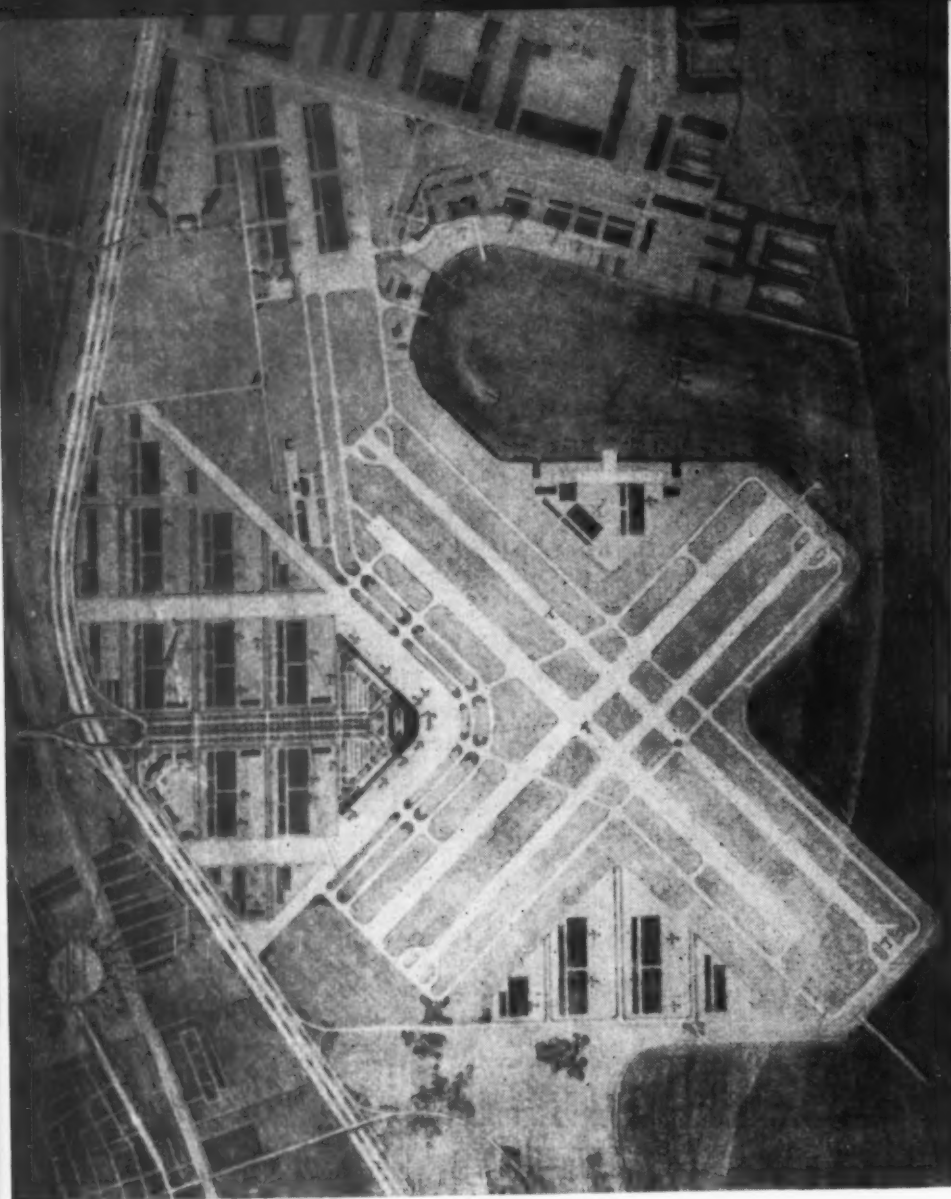
Since starting in 1944 the contractors have taken nearly all of their filling material—some 8 million c.y. to date—from one huge pit. On

earlier Army work the pit was worked by 2½-yard shovels and the conventional self-powered end dump truck. For the current air-field contract, however, Marco-MK have employed three electric shovels of 4½-yd. rock capacity fitted with 6-yd. dippers. Three diesel-powered shovels with 2½-yd. dippers have worked separate areas to start the road contract.

The plan of pit operation consists simply of removing a small mountain entirely from a single floor level. Working along a face some 1,000 ft. wide, the three big shovels take the stuff as it is shoved down by a fleet of four bulldozers working on top. The dozers work down in four benches of about 60 ft. height each. The very



★ How the airport looked late in 1946—present 6,000,000-yd. filling contract two-thirds completed. Displacement of under-surface muck progressed from the older ground in distance, toward the near shore, presenting a special problem



★ Master Plan for San Francisco International Airport

fine material requires some shooting for easy dozer handling, mainly as a safety measure against steep bank slides, since the loosened material then bucks down at a uniform safe slope angle.

All blasting has been done from holes drilled one bench deep by a sin-

gle seismograph drill rig. Holes of 5% in. diam. were drilled at about 35-ft. intervals.

The 6-yd. shovels operate on the main floor several hundred feet apart, on a floor kept scrupulously even and smooth by one or more dozers. This insures good drainage and haul-away

★ The three 6-yd. shovels in action. Over eight million yards have come out of this pit since 1944



conditions, and allows plenty of room for spotting wagons on alternate sides of each shovel. Wagons are backed into the bank when two are spotted, or spotted one at a time in a wide sweeping turn if coming up farther apart. In either case as many as ten wagons are usually to be seen simultaneously in motion on the pit floor, and operators work all the tricks in split-second spotting of dippers and maneuvering of wagons to get maximum output.

Two Types Fine Soil

The pit material is of two different types, both extremely fine. One is a brown decomposed sandstone clay-loam, 64% passing 200 mesh and 100% passing $\frac{1}{4}$ in. The other is of similar origin, a sandy loam 40% passing 200 mesh and 98% passing $\frac{1}{2}$ in. When mixed on the grade the fill material has shown an average optimum moisture ranging from 13% to 17% dry density 109 to 116 lb., liquid limit of 23, and P.I. from 0 to 5. Both soils, although practically a sand in characteristics, are plenty muddy after rains.

Pit material is cross-sectioned in place for payment. It has averaged 97.5% modified proctor in place. Bulking of 8% to 10% is allowed for on the grade.

Haul Road Has 3 Bridges

To describe the haul road further, it was laid out by the contractors on a private right-of-way, fenced in, ditched and given a heavy stone base on the knowledge that hauling costs would make or break the project, and that safety advantages alone would pay for the road. Grades over bridges and up the hill to the pit floor at about elev. two hundred ft. are limited to 5%. This grade required several heavy rock cuts such as you would expect to see only on a modern high-type arterial road—which in fact this road is. Curves are designed for 40 mph, or faster, and the 40-ft. paved roadway gives plenty of room for the two streams of broad-beamed wagons.

During the '44 and '45 operations the stone base was unpaved, and two or more motor graders aided by constant sprinkling had the devil's own time keeping up the smooth surface needed for efficient hauling. The asphalt pavement, placed at the start of 1946 work, has speeded hauling but not entirely reduced the dust problem, since the bottom dump wagons drop some of the dirt. The portion of the haul road across the expanding fill, of course, has required steady blading and sprinkling, as have pit extensions.

The road includes three overhead bridges, taking wagons successively

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★ Bottom-dump wagons dump parallel to the shore and the earth is bulldozed into the water with a head of 8 to 8.5 ft. above mean tide, best height for muck displacement

over the El Camino Real highway (20,000 daily traffic); the Southern Pacific main line (125 trains daily); electric line tracks; and the Bayshore highway (30,000 daily traffic). These structures required 454 tons of steel, 900,000 ft. BM of lumber and 300,000 c.y. of approach fills, all placed at the contractor's expense. The bridges while eliminating delays were considered primarily a safety measure, justified economically on the basis of reduced insurance premiums alone.

The contractors have invested over \$450,000 in the haul road to date. Although it is believed that the cost was largely written off on the 2,700,000 c.y. army contract (at \$0.78), the contractor built it as part of a gamble on winning later contracts. The present earth filling incidentally was awarded at \$0.623 per c.y. hauled and placed plus \$0.12 for compaction to 95% and \$1.60 per M gal. for sprinkler water.

33-Yd. 40-mph. Wagons

The feature of this job is easily the show put on by a fleet of self-powered wagons of new design. Comprising a 200-hp. diesel-powered tractor built in Oakland, Calif., and a 32.7-c.y. bottom dump wagon made in Los Angeles, this wagon has had no trouble at all in holding 40 mph., and could easily lap the smaller units on the job. Thirty of the rigs were ordered, and a gradually increasing number has been placed in operation, 26 at this writing. The wagons have fourteen tires, as shown in the photos. They weigh 140,000 lb. fully loaded.

Four hydraulically operated compartments permit dumping the forward or rear half of the load separately when desired.

Since they are 33-yarders specially built for this job, it is noteworthy that the contractor could not definitely order them until the contract was awarded.

Supplementing the specials are twenty 16.3 yd. new-type wagons, also of west coast manufacture, and thirty-two 13-yd. units of a type widely

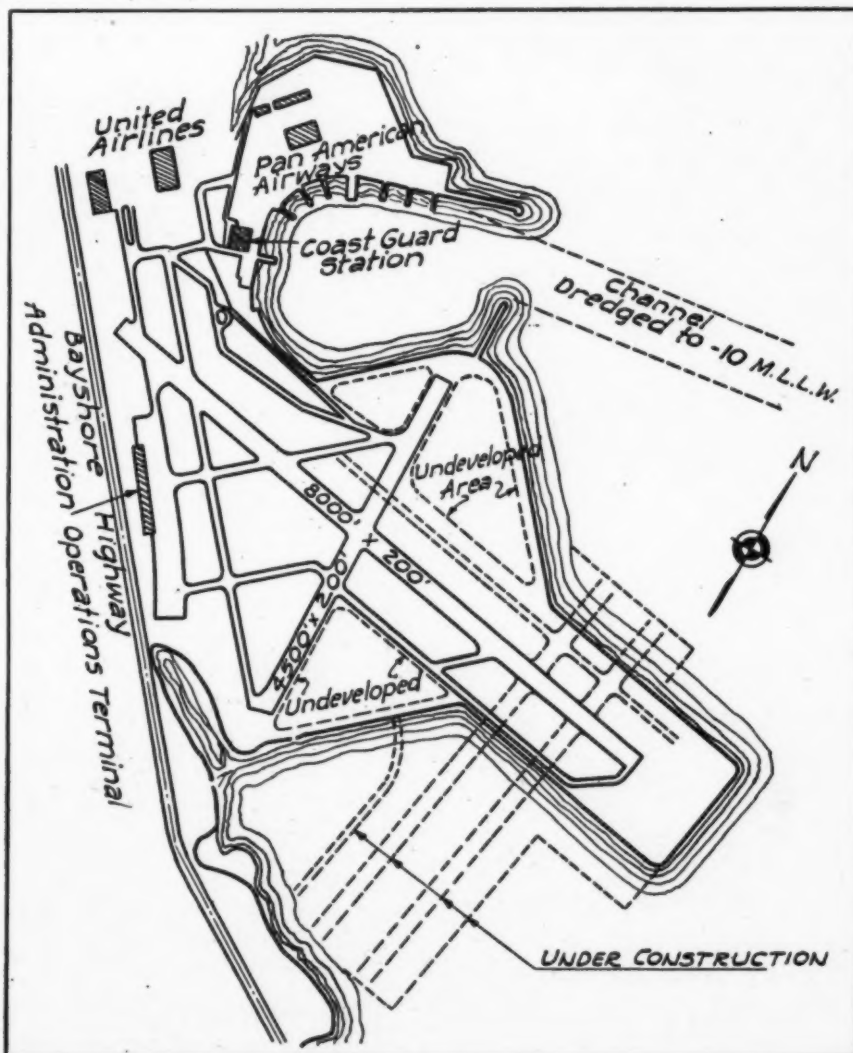
used throughout the country.

The 16.3-yd. wagons are of a design first manufactured by Ralph Dexson and tested by Peter Kiewit & Son Co. on their Santa Ana freeway contract at Los Angeles last summer. Also giving an excellent account of themselves, they include a bottom-dump-body resembling a clamshell in operation. This is the first project to use a sizable fleet of these units, which

are now understood to be in commercial production.

All machines in the three sizes are powered by 200 or 150 hp. diesel engines of a single manufacture, a fact which the contractors consider to be of advantage in simplifying servicing and repairs.

The two smaller-type wagons are capable of 30 mph. travel speed, and after experimenting with various



★ Present field at San Francisco Airport, in relation to work currently under contract



More Scenes of Macco-MK's Busy Haul Road



★ More glimpses of the half-million-dollar haul road of Macco-Morrison & Knudsen. Heavy cuts were made to keep grade to 5%. Three overheads spanned arterials and railroad tracks

plans of operation the contractors finally ordered all wagons, including the big 40-mph. rigs, to hold to 30 mph. in order to avoid accidents. Operators also are instructed to keep 250 ft. apart, but being human, these fellows have had a stubborn tendency to run closer. Accidents have happened, due principally to sideswiping in overtaking and passing and to running into large pieces of dirt dropped by the wagons ahead.

A Thousand Tires

Tires are naturally a big cost item in a fleet of nearly eighty wagons on such high-speed operation. The 32.7-yd. wagons employ dual 1800x24's on the rear, and the 16.7 and 13 yd. machines use single 2100x24's. Front tires are all 1100's or 1200's. Thus,

tire sizes are reduced to a minimum. No exact figures are given out by the contractors, but it is understood that tires are considered good for about 2,000 hours with safety.

Hauling proceeded through the summer on the basis of three 7-hour shifts daily, with 60 to 65 units usually working at any one time. The reduced yardage in November (450,000) was moved with two shifts. Haul distance has gradually increased until it is now over 4.5 miles, which would figure around 225,000 yd.-miles in a peak day, or over 22,000 wagon-miles on the round trip.

Compaction Methods

The contractor is required to place and roll fill in lifts not exceeding 12 in. compacted depth, the layers being

reduced to 3 in. within the top 30 in. of subgrade. Compaction required is 95% mod. AASHO under pavement areas and 90% elsewhere. Batteries of sheepsfoot rollers have been used exclusively up to this writing, 12 to 16 passes usually being required.

The fill material being very critical as to moisture, and practically non-plastic, its susceptibility to compaction with heavy rubber-tired equipment has been considered. Recently the contractor purchased a special sixty-thousand-lb. 5-wheel rubber-tired roller which had been developed by the U. S. engineers and used on at least one other California airfield. Looking something like a huge scraper, this unit is tractor drawn. The engineers and contractors hope to be able to secure specific compaction with fewer passes using this

roller—possibly with only 4 or 5—but sufficient data are not available at this time to determine its efficiency or to decide on permissible depth of layers or number of passes.

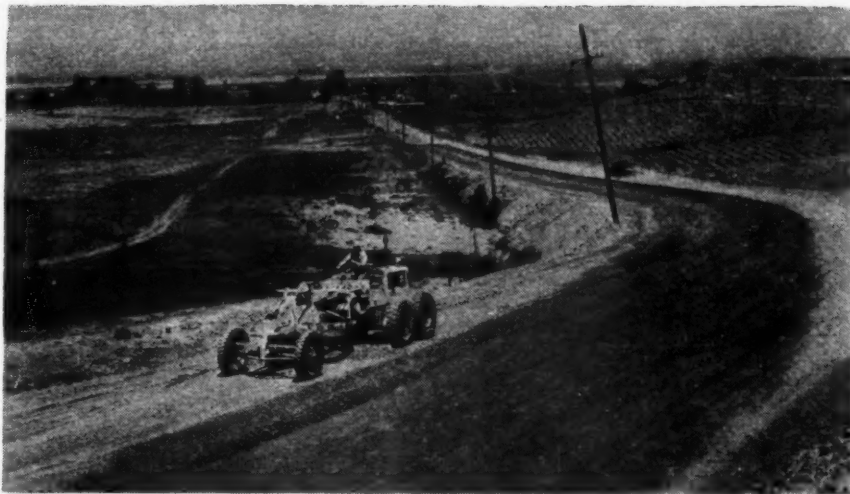
Proctor readings are taken for every lift, and every day's filling is bored to check underlying mud elevation. Hand augers have been used, some with 2½-in. bits, but a power boring rig is planned.

Bay Filling Problems

From an engineering standpoint, one of the most interesting considerations at the San Francisco airport is the problem of extending a fill over tidal land having an elevation originally of about -0.5 ft. Underlying the whole site and extending under the bay is 40 to 80 ft. of bay mud. Tides range from -9.0 to -2.0 ft. The presently used runways are at about +5.0.

The finished grade of the new field is to be at +12 to 14 ft. The first lift is being carried to +8.0 to 8.5, in line with previous experience showing this to be the best height for filling for the purpose of underwater mud displacement offshore. Preliminary filling has been compacted mainly by the heavy hauling equipment, 90% Mod. AASHO being required.

According to the engineer, this project involves a land-filling problem not experienced on previous work at the airport. In the past, mud was displaced offshore by spearheading

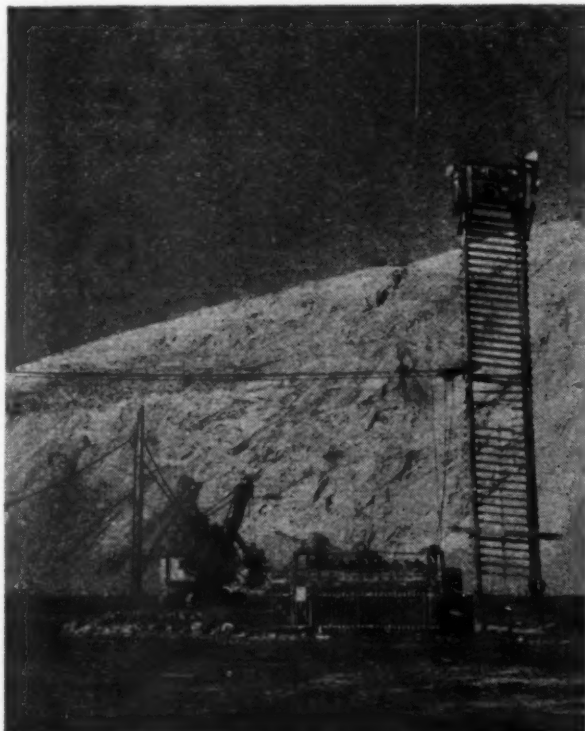


★ Looking along haul road toward the airfield. One or more motor graders keep the shoulders dressed, and concentrate when necessary on the unpaved expansion across the graded field

the fill out from one shoreline. In this manner the mud was kept moving without too much difficulty, providing the initial lift was maintained at the proper elevation. Elev. 8.0 to 8.5 was found to be best for the mud encountered, which has a shear value of about 6 psi. at 42% moisture, producing a mud wave 6 to 6.5 ft. deep. Mud displacement occurs on about a 20 to 1 slope. Surcharging above 8.5 ft. on the initial lift would produce a correspondingly higher mud roll, with the danger of seriously retarding



★ Contractor's engineer O. H. Tucker with project engineer A. J. Wehner



★ Electric light tower at the pit (note dozers working on top) . . . Special 60,000-lb., 5-tired pneumatic roller being used experimentally . . . Large overhead water tank along haul road, with 12-in. pipe for quick filling of 3500 and 5000-gal. sprinkler trucks

mud flow and allowing mud to fold into the fill.

On this project, however, filling progressed across a neck of water toward the main shore. The main fill had to be worked inward from two legs, a third leg being the shore line. The problem was to keep mud flowing for a distance of over 3,000 ft. converging from three directions, starting the flow at the angle of the two legs. This work has now been largely completed, and borings show that mud has been satisfactorily eliminated; a few minor pockets were draglined out and replaced.

During filling operations the trucks and wagons dump parallel to the edge along a line 20 to 40 ft. from the water's edge, and earth is bucked out by bulldozers. When beginning after rains the contractor is required to buck off the top layer of wet material, and they often use a suction hose on the sprinkler wagons to pump out puddles, to speed drying of the grade.

The second "lift" which includes the runway to subbase is being carried on simultaneously with bay filling, but at a safe distance back from the toe to prevent surcharge action before the underlying mud has had time to compress and reach a state of stability.

Other Equipment

The contractors also have a small fleet of tractor-drawn scrapers, which assist in scraping off wet material on the grade after rains and to short haul work; 18 heavy tractors performing the various tasks already noted; several end-dump trucks; 3 extra-large tank trucks (3,500 and 5,000 gal.); and some miscellaneous equipment although surprisingly little. Water for sprinkling and other use is metered from suburban mains. A 20,000-gal. water truck loading station equipped with a 4-in. pipe for quick filling is located along the haul road near the shop area.

Over a hundred mechanics, helpers, oilers and service men are required for 3-shift operation, and extensive shop facilities have been set up. Between shifts the wagons are drawn up in parallel lines on both sides of the haul road, near the shop area, and in the half-hour allotted all necessary greasing is done and fuel and oil supply replenished.

The airport project is being designed and supervised by the Bureau of Design, San Francisco Public Utilities Commission. B. M. Doolin is airport manager and A. J. Wehner, project engineer. George Hensel is general superintendent and O. H. Tucker, project engineer for the joint contractors.

Bid Details, San Francisco Airport, Let May, 1946, to Macco Corporation and Morrison-Knudsen Company, Inc., Joint Contractors

Item	Price	Unit	Contract Quantity	Estimated Amount
Dry fill .....	.623	c.y.	6,000,000	\$3,738,000.00
Compaction to 95% density.....	.12	s.y.	420,000	50,400.00
Watering	1.60	m.gal.	25,000	40,000.00
Rehandling fill material.....	.30	c.y.	135,000	40,500.00
Miscellaneous excavation .....	.50	c.y.	125,000	62,500.00
Sub-base preparation .....	.05	s.y.	4,000	200.00
Crushed rock base.....	2.00	ton	15,000	30,000.00
Prime coat	0.00	ton	50	1,000.00
Plant-mix surfacing	7.00	ton	600	4,200.00
Bituminous seal coat.....	.20	s.y.	200	40.00
Portland cement concrete pavement.....	.38	s.ft.	310,000	177,800.00
Cement adjustment price.....	2.26	bbl.	.....	.....
Drainage of existing mud fill area.....	5,000.00	l.s.	.....	5,000.00
6-inch salt glazed vit. clay pipe.....	1.20	l.ft.	100	120.00
15-inch reinf. conc. pipe.....	2.80	l.ft.	700	1,960.00
18-inch reinf. conc. pipe.....	3.40	l.ft.	800	2,720.00
21-inch reinf. conc. pipe.....	4.20	l.ft.	400	1,680.00
24-inch reinf. conc. pipe.....	5.50	l.ft.	1,100	6,050.00
21-inch corr. metal pipe.....	4.20	l.ft.	30	126.00
24-inch corr. metal pipe.....	5.50	l.ft.	30	165.00
21-inch auto. drainage gate.....	50.00	ea.	1	50.00
24-inch auto. drainage gate.....	50.00	ea.	1	50.00
Instal. 21-inch corr. metal pipe.....	1.80	l.ft.	350	630.00
Instal. 24-inch corr. metal pipe.....	2.20	l.ft.	350	770.00
Instal. 24-inch auto. drainage gate.....	10.00	ea.	1	10.00
Instal. 24-inch auto. drainage gate.....	10.00	ea.	1	10.00
Salvage 21-inch and 24-inch C.M.P.	2.60	l.ft.	700	1,820.00
New drainage inlets.....	200.00	ea.	4	800.00
Removal of drainage inlets.....	50.00	ea.	11	550.00
Reinstal. drainage inlets.....	50.00	ea.	5	250.00
Remove drainage struc. "X" and "Y".....	330.00	l.s.	.....	330.00
Total bid items				\$4,107,731.00

CAA Demonstrates Inexpensive Lighting for Small Airports

Small airports can be lighted for night flying at a cost of about \$2600, the Civil Aeronautics Administration reports, on the basis of an experimental installation at Aretz Airport, Lafayette, Ind., now undergoing service tests. The installation has been made for study of effectiveness, original cost and maintenance problems by the Experimental Station of the CAA at Indianapolis, where a two-color airport boundary marker light has been developed. Results thus far show that the lights identify the airport for a pilot flying at 1,000 ft. from a distance of 15 to 18 miles and in an exceptional case, the lights have been seen from 30 miles away. Operating cost for current is about 15 cents an hour.

Two colors for airport boundary lights were suggested originally by F. C. Breckinridge, light expert of the Bureau of Standards, and such a system has been in operation at Indianapolis municipal airport for three years. Under direction of Mark Gilbert, CAA lighting expert, certain provisions have been made in the original system to adapt it to small airports. The tubular lights, mounted in pairs parallel to the ground, show red on the side toward the airport, warning the pilot taking off that he must be in the air when he crosses the boundary, and green from the outside showing him it is safe to land

beyond the light. A new kind of gas tube light containing especially purified neon gas is used for the red light and a similar tube filled with argon gas provides the green light. The lights are mounted in front of reflectors in a unit covered by tempered plate glass impervious to extreme heat and cold changes. Each light is visible from 10 degrees below the zenith, and through a horizontal angle of 150 degrees. Enough heat is generated by the tubes to keep the glass cover free of snow and ice. The units are expected to cost not more than \$100 each.

By using ceramic electrodes in the tubes, it is possible to operate the lights at 750 volts instead of the 15,000 volts used at Indianapolis. This materially decreases maintenance costs, obviating short circuits caused by such things as spider webs in the Indianapolis system. The lights are twenty times as bright as the neon tubes used in electric signs.

Because most private fliers do not operate in instrument weather, the usual spacing of 300 ft. for boundary lights was increased to about 900 ft. at the Aretz field. With three lights on the short and four on the long sides of the rectangular field, the definition of the landing area is satisfactory. A few additional lights would be necessary in odd-shaped fields, or those shaped like a "T" or an "L". The Aretz installation includes four 45-foot poles to carry obstruction lights and a folding steel pole for the illuminated wind cone.

California's 2-Way Radio

With 24 land stations and 50 mobile units, California Division of Highways is making fullest use under present limitations; has been aggressive in national committee effort to secure broader license for nation's highway departments that will permit general administrative and operational use in maintenance and construction

TWO-WAY radio is a subject California highway engineers can't talk about without turning crusaders.

T. H. Dennis, maintenance engineer for the division of highways, is not just the boss of what is perhaps the most extensive radio system now devoted to highway use. He is also one of highway-radio's most persistent and eloquent spokesmen, along with W. B. Chilson of Chautauqua County, New York, and others we could name. Thanks to the committee effort of this group of enthusiasts, there is prospect that all state highway departments one of these days can have 2-way radio for general operational work, such as the railroads, bus companies and cab fleets are already enjoying. The state highway departments feel that similar consideration should be given to them since they are responsible for the safety and movement of some 30,000,000 vehicles of all types. But that is ahead of our story, which for the moment consists merely of a description of California's radio development up to now.

Began Winter '38-'39

The highway-radio idea in California took hold in winter 1938-1939 when five land stations were set up in Northern California for the purpose of directing snow fighting and handling winter traffic emergencies in the Redding area. Six mobile units were equipped to "talk back," and in no time at all the men on the plows and the cruising supervisor wondered how they ever got along without this modern aid.

From this beginning the system was extended until today there are 24 land stations and some 50-radio-equipped plow units, foremen's pickups and superintendents' cars.

The cars so equipped also include technician's autos, and one for each district maintenance engineer in the districts covered.

Of the stations, four are 200-watt or stronger, the rest 50-watt. The range of a 200-watt station, incidentally, is about 200 miles, and that of 50 watts, 50 miles.

The personnel engaged in radio operation is part of the maintenance department directed by the state main-

tenance engineer at Sacramento, who has a full-time assistant in immediate charge of radio work. This assistant, it is significant to note, is a highway engineer who has learned the operating problems and utilization of radio, rather than a radio technician or electrical engineer, and the choice



★ Snow plow in California mountain pass, with radio antenna raised to operating position



★ At left, a 200-watt land station, Redding, Calif., the first to be installed. . . . At right, interior of cab, showing radio installation on snow truck

has been a fortunate one. His interest is purely functional; the actual operation of the equipment is left to three radio technicians, reporting to a supervisory radio technician, who do nothing but maintain and repair the radio equipment.

The technicians, in turn, are not operators. Operators are all chosen from the regular highway maintenance staff, and consist of experienced snow plow men who have been taught how to operate their radio equipment as necessary in their work. They have a restrictive license, in contrast with the status of professional radio operators. This scheme, too, has proved to be a wise and practical one.

Mainly for Snow Work

Under the limited license presently issued, radio is limited to emergency

transmissions necessary for the preservation of "life, limb or public property," and only then when there is no means of land communication. In addition to the main overshadowing task of operating snow plows in the mountain passes, this definition of use also takes in the reporting of snow or land slides, floods, washouts and other road blockades, and that is about all.

Snow removal in California is confined to about 3500 miles of highways. Better than a half million dollars annually is budgeted for snow removal. The main show occurs on US 40 in the high Sierras, where Donner Summit with its huge annual snowfall (often 500 or 600 inches a year) is believed to be the scene of the nation's No. 1 rotary show. Echo Pass, on US 50, is also a mean spot, and there are other high-country roads that in former years were left to freeze in for the winter as a matter of course. Public safety is the first consideration, but the increased plowing efficiency—in terms of quick spotting of equipment when and where most needed—has paid for radio equipment. The profitability of radio is no longer questioned.

Broader License Soon

For some time the California and other highway departments have sought through AASHO committee action to obtain a broader type emergency license on a national basis of approval. This license would be similar to that now used by highway po-

lice, whereby transmissions would not be contingent on the availability of land-line communication. A resolution to the Federal Communications Commission petitioning for such a license in the interest of highway transportation was passed at the recent national AASHO convention.

This license is confidently expected within a matter of months. On securing it, the California division of highways plans to employ 2-way radio for operational direction of all general maintenance and construction, and will start immediately toward development of a state-wide system. The expanded system will have several times the present number of land stations and mobile units. The eleven highway districts will each have their own area system, all of the same frequency, with facilities for inter-district and headquarters communication.

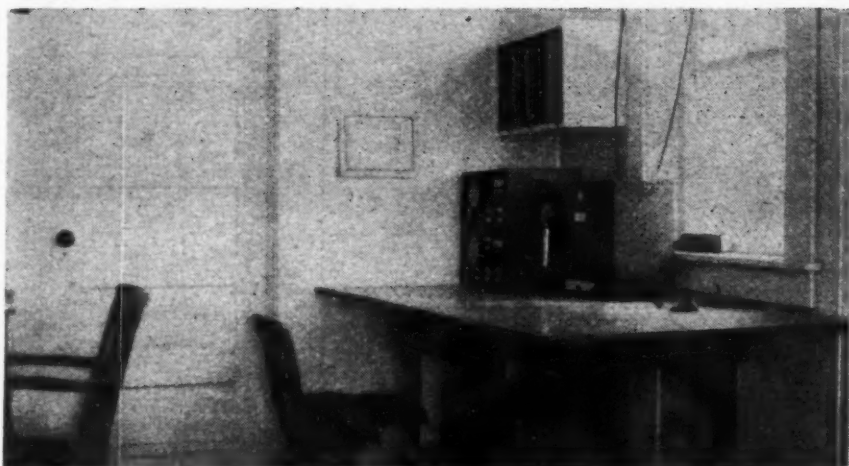
California would probably employ a medium-wave Amplitude Modulation (AM) frequency, due to terrain, but it is expected that most states would consider Frequency Modulation type of transmission.

Equipment needed for the most part is presently being manufactured, and within a year the radio industry expects to be in production on any remaining items.

The installation cost of a 2-way radio system, of course, will depend on many factors—geographical features, area covered, ultimate use, number of units, etc. While California officials would not give definite figures on estimated cost, they have done enough figuring to believe that first cost is no obstacle and that the cost of installing and operating 2-way radio will quickly pay for itself in



★ In front of the Mt. Shasta City radio station on US 99, Calif. Also a 50-watt station



★ A 50-watt land station, California

better highway safety, traffic control and organization efficiency.

It will tie the far-flung highway organization closer together, assure greater utilization of men and equipment, and speed up work generally.

1946 Rural Traffic Breaks All Records

Travel on rural roads during 1946, the first postwar year, broke all records, rising to an all-time high of 170 billion vehicle-miles from a wartime low of 101 billion miles, and exceeding the volume of travel in the prewar peak year, 1941, by approximately 200 million miles, according to figures compiled by the Public Roads Administration, Federal Works Agency, from data supplied by state highway departments.

The increase in rural travel in 1946 beyond the 1941 peak was largely due to considerable gains in the western states, where an increase of approximately 20% was recorded. Rural travel in the central states was 0.6% greater and in the eastern states 9.6% less than in 1941.

During seven months of the last year—January, February, March, April, September, October and November—travel on rural roads was greater than the volume of travel recorded for corresponding months in 1941, but fell slightly below the 1941 level in other months.

1946 Truck Registrations All Time High—Approximately 27,500,000 privately owned automobiles were registered in 1946. This was 2,000,000 fewer than the 1941 registrations. However, truck registrations rose from 4,859,244 in 1941 to an all-time high of approximately 5,500,000 in 1946.

Meetings Ahead

American Road Builders' Assn.—44th annual convention, Palmer House, Chicago, Feb. 17-20.

Association of Highway Officials of North Atlantic States—annual meeting, Hotel Traymore, Atlantic City, Feb. 26-28.

Highway Engineering Conference, Ohio State University and Ohio State Highway Department — Columbus, Mar. 18-19.

3rd Annual Michigan Highway Conference—Pantlind Hotel, Grand Rapids, Feb. 25-27.



★ This steep, high cut slope along U. S. 99 in Washington state is quite stable, but by-passing of surface water from above was necessary to minimize surface washing. Shown here is one of several corrugated pipe run-downs installed for this purpose.

AGC Takes Stand Against

Restrictive Union Practices

General contractors' convention covered varied program on labor and tax questions, equipment and materials outlook. Expanded Highway and Airport Division considered construction outlook, specifications and other industry problems

A RESOLUTION urging trade unions in the construction industry to eliminate restrictive practices in the interest of economy and efficiency, was a high spot of AGC's annual convention, held Jan. 27-30 in Chicago. It was one of several labor resolutions, others being:

1. That AFL's building and construction division take immediate steps toward settlement of jurisdictional disputes without work stoppage.

2. That escalator clauses be omitted in contracts for heavy construction projects expected to require less than 2½ years, and required for shorter-time projects only after consultation between owner and prospective contractors.

3. That local apprenticeship programs be stepped up at once.

4. That labor laws be revised generally to promote efficiency and economy of construction.

Policy on Labor

The AGC's policy on labor law, as defined by committee, is as follows:

1. Equal responsibility of employers, organizations of employers, and organizations of employees be required.

2. Employers be granted free speech in discussing employer-employee relationships.

3. Employees be protected from coercion and exploitation by union representatives and employers.

4. Supervisory and administrative employees exercising a function of management be excluded from union agreements.

5. Secondary boycotts and sympathy strikes be outlawed.

6. Employment and interstate commerce be defined.

7. Compensable working time be defined as a matter of employer-

employee negotiation.

8. Mandatory provisions of the Fair Standards Act requiring assessment of penalties be repealed and the assessment of penalties be left to the discretion of the courts.

9. A limit of one year be established within which claims can be sustained for alleged back pay.

10. Settlement of claims for back pay be legal and binding on both parties if arrived at by mutual agreement.

Significantly, the foregoing actions preceded by only two days the President's announcement of organized labor's national ban on strikes in the

building and construction industry.

Other resolutions recommended removal of all government restrictions on building to stimulate rental housing, and the opposition to establishment of TVA-type authorities for other regional valley development programs.

Coming back to the matter of restrictive union labor practices, a committee statement deplored the growing tendency to compel unnecessary employment of high-priced skilled trade workers on tasks where their services are not needed. [See November, 1946, *ROADS AND STREETS*, "Picture of the Month."] The matter is to be brought to the attention of national labor leaders in an effort to enlist their support in eliminating this impediment to construction progress.

Broad Program

The three-day session included addresses by Thos. H. MacDonald, Commissioner of Public Roads; Lt. Gen. Raymond A. Wheeler, Chief of Engineers, U. S. Army; Wm. A. Danner, Exec. Vice Pres., Associated Equipment Distributors; Richard J. Gray, of A.F.A.; J. L. Haynes, Chief, Construction Division, U. S. Department of Commerce, and other notables. The following notes pertain to the highway contractor sessions:

Notes on Highway Session

At the AGC Highway Division meeting, presided over by Morris W. DeWitt of Popular Bluff, Mo., we jotted notes of several significant topics:

Managing Director H. E. Foreman's recent reminder that free competition among contractors is the strongest force toward reducing construction costs, was restated here.

Airport Program—Forest Brooks, Chief, Requirements and Compliances,

F. W. Parrott, New AGC President

Forrest W. Parrott, Sioux City, Ia., vice-president, C. F. Lytle Co., was elected president of the Associated General Contractors, succeeding Warren S. Bellows, Houston. Mr. Parrott has been an Association director for several years, and is a past president of the AGC Iowa chapter.

D. W. Winkelman, of D. W. Winkelman Co., Syracuse, New York, is vice-president for 1947.

H. E. Foreman and James D. Marshall were re-named managing director and assistant managing director.

G. G. Armstrong of Roswell, N. Mex., was elected chairman of the Highway Contractors' Division, succeeding Morris DeWitt, Poplar Bluff, Mo. Harry J. Kirk continues as manager of this division, now renamed the Highway and Airport Division as a mark of its expanded activities.

CAA, Washington, D. C., described the scope and nature of the 1947 airport program. Half the 800 fields programmed will be entirely new ones. All work done through state or local agencies. Contract rather than force account procedure must be followed on all fields costing over \$15,000 in federal-aid, or \$30,000 total. About ninety per cent of the funds will go for construction.

The AGC Highway and Airport Division is forming a joint committee with the new American Association of State Aviation Officials.

1946 Road Volume—A. C. Clark, Chief, Div. of Construction, PRA in Washington, announced that the 1946 federal-aid road construction volume totaled \$518,000,000 for 18,000 miles of projects (including national forest highways), of which only 0.3% was by force-account. In addition, \$229,000,000 of highway work was let without federal aid, 13% being force account. These figures speak convincingly of the national policy of letting highway work to contract whenever feasible.

1947 Outlook—Mr. Clark noted that 1947 volume will depend on availability of contractors, labor and materials as well as the price situation. Of the 187,000 miles of the nation's highways constructed to date with federal funds, 14.5% have become obsolete, and 65,000 miles for one reason or another will need early replacement. States in general are in good financial position, but the serious rise in maintenance costs is a threat to construction funds.

Recent Contract Prices—1946 F.A. contract prices average 66% over 1941 in the first nine months, 86% over in the last quarter, 71.6% over for the year. The upward trend has shown no sign of turning. Improvements in design are admittedly a factor in these prices. Uncertainties faced by contractors on long-term or carry-over projects is a key influence.

Mr. Clark defended the 1940 base-price comparison policy of PRA, saying that, while admittedly not perfect, it has taken the price question out of the field of personal opinion. It has also shown up certain local tendencies to bid excessively high prices on such items as concrete on a traffic-will-bear basis. During the war there was an increase of 45% in the number of contractors bidding on highway work. The excessive bidders were inclined more to come from the new-comers.

Work Slow-down—Progress today, continued Mr. Clark, is lagging from the normal efficient rate of production on 30% of all road contracts under way. Some of the trouble is due to

a lack of efficient supervisory personnel in both the highway departments and the contractor organizations.

Material shortages are likely to continue. Over 400,000 tons of structural and bridge steel are estimated to be needed for 1947 state highway projects; also 16 million bbl. of cement, or 8% of mill capacity. Equipment availability is hard to forecast; new models, when they arrive, will often reduce costs of doing work.

Joint AGC-AASHO Committee

The Joint Cooperative Committee, AGC-AASHO, held an all-afternoon session, at which G. G. Armstrong, was made chairman for 1947 succeeding Morris E. DeWitt.

Continuing from its successful December meeting at the highway officials convention in Los Angeles, this young but potentially very important committee made some progress on several topics. Following are some of the more interesting points:

Chairman DeWitt noted that it is fallacious to apply average cost comparisons rigidly in ruling on specific project bids...lack of bids is often due to the regular prior rejection of bids.

A low bid at an open competition letting should be accepted by the engineering body as the going price of contract work in the area. The engineer has no right to say "prices are out of line," although, of course, he does have the right to reject bids and withhold projects. Engineers' estimates, observed Mr. DeWitt, do not always fully reflect the contractor's costs. Engineers may be aware of on-the-job costs, but fail to gauge the hidden economic factors affecting a contractor's profits.

Contractors and engineering departments both want to get the job done, yet some project engineers and inspectors show a vindictive attitude and seem to be looking for technicalities which do not necessarily aid job quality or efficiency.

More Subsurface Data

Several delegates took part in a spirited discussion of the old question of subsurface data as it affects bidding. The main reason for giving the engineer a set of plans is to aid him in bidding and performing the work with greatest efficiency. Engineers, however, have gotten into a rut of hereditary practice. Plan sheets contain stock phrases disclaiming responsibility for the accuracy or completeness of data shown, showing a fear of legal come-backs or personal embarrassment. There is a great need to clarify the responsibility

of the engineer and that of the contractor in furnishing information on soundings and borings.

In Indiana, noted Sam H. Hadden, the contract stipulated that the contractor must satisfy himself on the accuracy and completeness of data, and went on to ask, "Why do we furnish data then fail to guarantee it?"

D. W. Winkelman, contractor of Syracuse, reminded that one of the best ways to sell a contract at the lowest price is to give the best information available to help reduce risk. "You'll get a fairer bid," he said; "it is disastrous for a contractor to base a close bid on sketchy test holes. If the owner won't stand by his tests, it is better to have no test data and let the contractor put in a contingency item."

It was noted that in many states the contractor is liable in the courts even though the data is disclaimed on the plans.

Mr. Winkelman said he has never seen boring data that even approaches actual conditions. Since soil investigations are necessary for preparing engineering designs and estimates, why not make them more complete, rather than try to get by with a few test pits or little drilled holes.

C. A. Hathaway, who presided over this discussion, concluded in the same vein.

Soil Classification

This line of discussion inevitably led around to the old subject of "Classified vs. Unclassified" excavation. It was noted that conditions of weather, moisture, soil layering, etc., have a far more important effect on costs than the actual classification of respective soil layers. Soil situations in glaciated regions are particularly complicated, and one engineer said he would hesitate in his state to show any subsurface information on the plans.

Another idea expressed was to give all possible data on the grading plans, but to pay on a classified basis for quantities actually encountered.

Eliminating Design Frills

Discussion entered for a time on construction requirements and design practices that require excessive hand labor. Better worded specifications are needed that will allow the contractor to dress cut slopes, for example, either by hand labor or machines, as he finds most economical.

A South Dakota delegate questioned the need for standards required by PRA on secondary federal-aid projects, which are often identical with primary f.a. requirements and involve a large amount of hand finishing to

(Continued on page 116)

AASHO Los Angeles Meeting

Nation's Road Modernization Program

Must Be Stepped Up In 1947 . . .

Warned highway leaders, who underscored need for new tax revenues, better planning, increased salaries to attract new high-type personnel. Grist of papers also covered safety and traffic problems, two-way radio, bridge clearances, truck load limits, many phases of materials, maintenance and road design

A ROAD repair bill of \$750,000,000 last year was one of the prices the American public paid as a consequence of inflicting 350 billion miles of traffic on its war-worn highway system.

Loss of thousands of lives from accidents and untold millions through congestion and business delays were additional penalties for failure of highway modernization to keep pace with wear, obsolescence, expanding need.

These are some of the facts presented by Public Roads Commissioner Thos. H. MacDonald at the 32nd annual meeting of the American Association of State Highway Officials, held at Los Angeles just before Christmas. Reminding that over 27,000 miles of the 187,000-mile federal-aid highway system needed some kind of reconstruction, the Commissioner went on to picture in a remarkable manner the part that highways play in American life. This is a familiar subject, often hashed over by all of us. But it needs re-telling to the public with new drama and impact, and the Commissioner performed a service of great significance to highway engineering and the highway industry by re-stating so vividly the highway's role in our national economic and social life, and the responsibility that rests with highway administrators.

Legislative Needs Stressed

In his presidential address, M. J. Hoffman of Minnesota revealed that \$479,000,000 in federal-aid projects were let during the first eleven months of 1946—representing prewar

volume, but less than half the pace hoped for. A considerable disparity occurred between individual states in percentage or available funds obligated, due to a "damned if you do, damned if you don't" situation where-in public criticism might be forthcoming if projects were held up and also if let at too high prices.

With two billions in federal funds accruing for the first two post war years, only about one-third has been taken up, and some states will not be able to absorb their allotments within the legal time limit. The loss of federal-aid to any one state thus incurred will work an injustice, and Congress should be asked to extend the time limit, said Mr. Hoffman. The matter of future federal legislation requires careful review, he stressed. Slowness in expending available federal road funds might lead to the suggestion that federal highway aid be drastically reduced or postponed. With congressional hearings anticipated soon, warnings sounded by various groups should be heeded.

Truck Load Limits

The new streamlined committee organization in Congress has thrown roads into the hopper with other public works, and highway legislation will be routed through new channels. Mr. Hoffman noted that this change may result in a new method of evaluating national highway needs.

C. L. Motl, maintenance engineer, Minnesota, in the committee meeting on maintenance and equipment, observed that the maintenance engi-

neer is put "in the middle" by the pressure of truck owners to overload the highways. He must help demonstrate to local citizens that a road has only so much load capacity, and that a costly failure will follow overloading. Minnesota has 5,000 school buses, and many weigh over five tons empty. Highway officials have had to get after school boards.

During the spring thaw, no secondary road in Minnesota can safely be counted on to carry over 4 tons on an axle, further noted Mr. Motl, who considers the highway load question as the No. 1 problem in road maintenance. Of Minnesota's 130,000 trucks, 55,000 are light pick-ups, 5,500 are so-called 1½-ton trucks (but often loaded up to 7 or 8 tons) and the rest are larger. Analysis shows that a 5-ton spring load restriction permits 96% of the state's vehicles to use the highways.

A California spokesman said that for a given road or bridge, the engineers make a ruling on restriction to a stated axle load after holding public hearings. This procedure is for secondary roads and is based on a determination and explanation of the physical facts involved.

Consensus was that the war has spoiled truckers and that they must be re-educated. But it is the on-and-off trucker and not the commercial fleet owner who causes the most trouble over weight violations.

In a concurrent meeting of the bridges and structures committee, several members united to oppose a suggestion by Professor John S. Worley, University of Michigan, advocating approval of heavier truck loads by

using more axles to improve weight distribution.

Pavement Joints Again

The perennial subject of pavement joints again came up for discussion in the maintenance committee session. L. L. Marsh, engineer of maintenance, Kansas, observed that joints between bituminous shoulders and the slab constitute a 10-times-larger footage than transverse expansion joints, and should receive more thought. Kansas engineers recently have spent \$14,000 for poured rubberized joints, but do not feel that they have the answer yet.

W. H. Root, maintenance engineer, Iowa, advocated elimination of expansion joints. He also said that Iowa has experimented with omission of filling of joints and had had no trouble over a period of 15 years. Good aggregates are credited as the reason for the excellent performance of the state's concrete. Some thousand miles of older concrete roads built with less satisfactory aggregates have required major attention, and the policy has been to give them a seal cover.

California practice now is to seal joints along paved shoulders and a machine has been developed to reduce the labor. Using 1,000-gal. tanks, a mixture of 60% of 30-40 pen. and 40% of 90-95 pen. asphalt is applied, using two hose lines on extension arms and a hand nozzle for applying. The machine travels at 2 to 2½ mph. max. It is followed by men with hand pouring cans, 400-gal. kettles which are heated periodically from a larger tank. This procedure has reduced crack sealing costs from \$150 down to \$80 per mile. Sealing is not regarded as being so essential when the base is impervious.

F. N. Heem of California told of a rubber latex and asphalt joint sealing mixture which has been observed in place for ten years. Made as an emulsion using SC-4 California liquid asphalt, this material has a similarity to commercial compounds except that it doesn't require heating for application.

Equipment Still Scarce

Delegates from several states gave case histories of their inability to get war surplus equipment and of the continued shortage of certain commercial equipment and parts. Some makers of shovels, graders, etc., want 12 months' delivery time.

W. H. Root of Iowa said that wartime shortages had taught his staff two valuable lessons: "We've learned to save money by making equipment last longer and had time to revise our

specifications to call for equipment more in line with special needs." Immediate replacement of all 5-ton trucks now wearing out would be a costly item, he noted, and the Iowa department is working out a plan to utilize lighter equipment for snow removal for the time being.

R. H. Stalnaker, equipment engineer, California, described briefly his department's equipment salvage work, which has continued since the war. Metallizing has proved to be one large source of economy, an \$80 shaft, for example, being restored by this means at a cost of about \$30.

2-Way Radio

T. H. Dennis, California, told of the use of 2-way radio in directing snow removal and meeting emergencies, and of advisory committee appointed by the California legislature to coordinate state action seeking a broader license for highway work. [Extended article elsewhere in this issue of R and S.] Radio equipment is said to cost about \$600 per vehicle to install.

A Washington state delegate reported recent installation of radio phones on 12 mobile units. Ohio also has installed 16 units on a trial basis. States were advised to get new post-war apparatus rather than war surplus. The Federal Communications Commission has allocated 283 channels for highway use (bus lines, transit and cab companies, etc.) and bus companies are considering setting up stations along their lines. A plea was made for highway departments to take quick action, before best channels are allocated to others.

Maintenance Well Discussed

C. L. Motl, Minnesota, in the maintenance session noted that prevention of spring damage isn't entirely a drainage problem, but one of enforcing weight restrictions in his state. The common fallacy of highway departments is to base seasonal load restrictions on weak bridges, rather than weak subgrades. It is the latter that suffer by far the most costly damage, particularly on secondary roads.

Coordinating Design and Maintenance

A report by A. L. Donnelly, Connecticut (read by T. H. Dennis), told that a recommended procedure is to coordinate maintenance considerations with road design. Field inspection by other highway department bureaus determines adequacy of the proposed design. A construction ex-

aminer for the maintenance department looks the plans over for weaknesses that might affect maintenance, giving attention to drainage, safety features, backslopes, base, etc. A written report by the design engineer then reviews any proposed changes suggested by other bureaus. The aim, however, is to minimize last-minute changes that will seriously delay project letting.

A questionnaire on this subject revealed that 9 state departments have a maintenance engineer review plans before adoption and go over completed projects before acceptance; in 16 states the district engineer serves both these functions; in 10 states there is no definite procedure.

Subsurface Drainage

E. L. Worthington, West Virginia: Subdrainage design should be considered more fully in the original pavement design, especially in rock cuts, through vertical curves, foot of grades, side-hill locations, etc. Drains are not considered a cure-all, but his state is installing side drainage with porous pipe, the top of the pipe being laid at an elevation with the bottom of the pavement slab. Backfilling is capped with 3 or 4 in. of impervious material. Some 55,000 lin. ft. of such pipe has been installed at a cost of 38 to 50 cents per foot of drain. Hill-side seepage may require setting drains deeper, in order to lower the water table in the presence of capillary attraction.

In Connecticut as part of extensive modernization of old water-bound macadam, voids are made ¼ to ¾ in. after experience showed that larger

Mail Inserted Card or Inquiry Blank (page 127) for Equipment Data

Again this issue of *Roads and Streets* carries descriptions of many new labor-saving efficiency devices and latest material developments. See our New Equipment and Materials Section beginning on page 106, for which a numbered reply card has been inserted to help you request data on items that interest you. Also on page 127 is an inquiry blank and advertisers' index which will help you get data on equipment and materials you need.

voids silted up rapidly. Connecticut first failed with subdrain installations based on an arbitrary 3½ ft. depth. Connecticut now uses a large quantity of perforated metal pipe for subdrains in combination with catch basins and other surface drainage. Some 32 miles of such pipe laid since 1939 has lowered the cost of ice removal due to inadequate drainage. Combined surface and sub-surface drains, usually 12 to 15 in. diam., have been used but are now discouraged because of silting.

A Utah engineer also advocated plenty of depth in placing subsurface drains, particularly to intercept seepage. The best subdrainage, he said, is a blanket of porous material under the entire pavement.

The discussion on this subject was concluded with the thoughts that designers need more subsurface data, that adding to the pavement thickness won't compensate for lack of drainage, and that first cost shouldn't be a deterrent in making fullest necessary use of subsurface drainage.

Snow-Plow Lights

A subcommittee on snow plow lighting recommended that plows and ice removal equipment be equipped with uniform identifying signals and lights. This equipment would include two headlights, clearance lights, and a 6-in. min. flashing blue light mounted on the cab.

Shoulder Maintenance

On shoulder maintenance, L. F. Schaeublin of Ohio said that upkeep of shoulders is a problem along his state's large mileage of 16-ft. concrete and bituminous roads. The budget doesn't permit wholesale widen-

ing or stabilization of shoulders, maintenance funds having been reduced by staff pay raises and priority surface treatment. A shoulder drag and other devices have been tried for keeping ruts smoothed and material laid up against the slab, and the department is seeking other solutions.

R. H. Baldock, chairman of the maintenance committee session, said that highway departments must put their finances in order so that maintenance will not be skimmed and depreciation will be systematically taken care of. A well-balanced highway program will take care of debt source, maintenance, administration and depreciation before financing any betterment or extension of the highway plant.

Bituminous Additives

F. N. Hveem of California, on the subject of anti-stripping compounds for asphalt work, said that California had set up an experiment project in an area where hydrophyllic aggregates abound. One problem involved is the possible stripping damage to sections of highway under construction during sudden rain storms. Delegates from several states told of use of additives, one speaker saying that 2% additive has improved patching mixes. D. N. Stewart of Colorado spoke of employing one commercial type for a variety of bituminous operations, saying that he feels it worth while. It has cut chip losses in sealing with RC 3 and 4 and road oils. Stockpiled patch material can be worked longer.

Further investigation of the value of additives in surface treatment was recommended. Virginia has specifications for this use and an extensive treatment program. The importance of differentiating between spot application and blanket use was noted. Use of additives with SC asphalt and tar was still considered controversial. The general feeling was that additives are a coming thing but no cure-all, and that the difficulty at present is to write the right specification. One problem is to tell by test whether such materials are present in the asphalt. A difficult laboratory identification and control task was foreseen by one speaker if several commercial types of additives get into the specifications.

W. W. McLaughlin, testing and research engineer, Michigan, told of extensive research on anti-stripping agencies in his state, which often has to aerate material on the road before application of bitumen in order to reduce moisture from 4 or 5% down to the 2% to prevent raveling. No single

agent is completely satisfactory with all aggregates. The types of bitumen also seem to be a factor in success. Clean, coarse aggregate is best, washed when an excess of moist clay fines is present. When densely graded wet aggregates are used, there may be a lack of stability due to the lubricating effect of the combined bitumen and moisture in the mix.

E. F. Kelly, PRA, Washington, D. C., told of experience with additives on a late-autumn eastern project. He concluded that additives are beneficial and economical at the present cost of 1½ to 2 cents per gal. of asphalt, giving greater freedom against weather delays for late-season work. No standard percentage of admixture can be fixed as best for all hydrophyllic aggregates.

F. V. Reagel, engineer of materials and tests, Missouri, told of stripping trouble which seems to be due to the presence of the seal on hot-mix resurfaces over old pavements. His state has rolling grades on which subsurface water is not always properly intercepted. Serious deformation may occur over localized areas due to formation of a crust of stripped material and rich segregated material. Sand mixes on flexible bases show no such trouble, which seems to be due to subsequent sealing of open-mix asphaltic concrete (on an impervious base) in which moisture accumulates. His problem is to predict the conditions which will cause a tendency of stripping.

F. N. Hveem on this subject said that sealing has brought trouble on many California roads where more moisture comes up through the road than goes down into the road from rain. The problem of specifically curing stripping trouble for a given aggregate hasn't been solved satisfactorily. He warned engineers to pay more attention to the movement of vapor through asphalt. Even an asphalt film ¼ in. thick is like a sieve microscopically, he pointed out.

One experience, according to Mr. Hveem, is that in pavements built with wet aggregates the aggregates must ultimately be dry at some particular time in order for adhesion to occur. Additives are definitely beneficial in that they hasten the drying of mixes under grader blades. They are not effective, however, against rain which may fall immediately after completion of the road, although they may be highly beneficial in case of rainfall a few hours later.

Air Entrainment Experience

C. C. Hallvik, maintenance engineer, Idaho, in the materials commit-

Safety Needs

From Maj. General Philip Fleming's paper (read by D. C. Greer): Spasm safety campaigns produce no benefits. . . . That safety rule is best which enforces itself or is logical and instinctively obeyed. . . . the 1946 fatalities will total about 4,000 less than the all-time-high 34,000 of 1941; nevertheless, there were 27,520 traffic fatalities first 10 months of '46. . . . August fatalities past year were at rate of 7.0 per million vehicle-miles, as against 10.2 long-time average. . . . continuation of state action-conferences based on the President's conference are all-important.



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tee session, reported on a survey of practice in use of air entrainment in concrete. Air limits in present state specifications range from 2 to 8%, being specified at 3-6% in 11 states and 3-5% in 7. Only 3 states require automatic dispensers, 3 states forbid them, and several "will permit." As to field determination of air content, 12 states use the "Indiana" method, one state uses reduction in unit weight, 7 make no determination. Determinations, when made, are made

at various frequencies—2 states on a per-shift basis, 2 per 50 or 100 c.y. concrete, 2 on basis of sq. yd. of pavement (500 and 5,000). Eight specify number of tests per day, varying from one to twelve.

Fifteen states reported trouble checking actual with theoretical unit weights of concrete, due to inconsistencies in sp. gr. or absorption or existence of air in normal concrete. Six states consider use of richer mixes for air entrainment, 24 adjust sand

for workability, only 2 states change slump over normal concrete slump requirements, 21 states have test projects.

Five state replies said that air entrainment might be considered as an aid with reactive aggregates, although California tests to date were reported to show no benefit. In conclusion, air entraining concrete has gained general acceptance in the northern states. Interest in its structural use to minimize segregation is

From Commissioner MacDonald's AASHO Talk

(Editor's suggestion: Show these facts to local newspaper editors)

"About 40% of the normal estimated program has been placed under way since the wartime bars were let down . . . further extension would not have been justified, since 28% of the projects are lagging due to deficiencies in one or more of the necessary elements."

* * *

"As public officials responsible for highway administration, it is our duty to inform the public at large, and more particularly the legislative branch, state and federal, of the problems currently confronting the integrity of our highway plant. Fortunately, to serve this purpose, we have the factual data from the highway planning surveys."

* * *

"Highway improvements cannot be evaluated as public works. Their services must be measured in terms of saving lives, of preserving property values, of maintaining essential services, and of sustaining major industries. The too prevalent concept of holding back highway improvements to bolster employment, if and when unemployment appears, is a completely fallacious theory. It disregards the essential principle that the highway plant, like all physical properties, is constantly deteriorating. . . . The only approach is to accept the principle that to avoid irreplaceable losses the highway plant must be continuously renewed and replaced."

* * *

Total highway use skyrocketed from 55 billion miles in 1921 to 333 billion miles in 1941—2,400 miles per person annually, said the commissioner.

"All-weather road mileage increased from 387,000 in 1921 to 1,385,000 in 1941; high-type surfaces, from 36,000 to 194,000. The consumption of motor fuels increased six times while all-weather surfaces increased between three and four times. The individual motor vehicle's annual travel during this period increased from 4,500 to 9,000 miles. . . . Gasoline taxes have increased steadily since 1918. A searching examination of the relation between the rate of taxes in the individual states and the individual state consumption of gas does not disclose the slightest evidence of restriction of the market from this cause. On the contrary, since the income from these taxes has been so large a factor in extending the mileage of improved roads, the conclusion is inescapable that the constantly growing market for motor fuel is a direct result of these taxes."

* * *

Traffic in October, 1941, was the highest in history for that month—up 31% in the 11 western states and 45% in California alone on main highways over 1941 volume. Traffic in various regions was up 23% to 30% over October, 1945; representative cities, up 15% to 34% over 1945.

" . . . highway expenditures have been declining for a considerable period." (Totals for 3-year periods from 1923 through 1942, including WPA were: 5.9, 8.0, 6.6, 7.5, and 7.4 billion dollars).

* * *

"During the war years, this last figure (7.4 billions) fell off sharply. It may come as a surprise that 1927 to 1930, with an annual aver-

age of \$2 billion for all highway and street purposes, was the peak period of highway development. A constantly declining expenditure since has resulted in the accumulation of a back-log of several billion dollars in deferred construction expenditures, needed to replace the obsolescent condition of our main state highways, to provide facilities for relief of traffic and parking congestion in cities, and to make needed improvements on our principal secondary roads. Unless a given segment of road is resurfaced or reconstructed at the time when, by reason of obsolescence or structural deterioration it needs replacement, not only does it become an obstacle and a hazard to traffic, but it also becomes a financial liability in that maintenance costs become excessive and the cost of reconstruction, when the work is finally done, is likely to be unduly high because of loss of salvage value. Thus the very existence of the continually depreciating highway plant imposes on highway administrators and engineers the necessity to plan for a continuous, rather than a sporadic, program of construction and maintenance.

"In 1946, the total of all State and Federal imposts upon the road user amounted to no more than $\frac{1}{4}$ cent per mile of travel. If the cost of car ownership and operation is no higher than four cents per mile, a figure far too low for a fair average, the highway cost would be only 18.75 percent of the operation cost. This is less than the differential between operating cars over worn and rough roadways, as compared with the cost of operation over smooth roadways.

growing. The chief concern is over control of air and other characteristics. In California, reported T. E. Stanton, air entrainment apparently improves durability against types of weathering action other than freezing and thawing. Tests are under way.

Air entrainment, however, will not aid against freezing and thawing deterioration which is traced to bad chert gravel aggregates, it was reported from Iowa.

To Trench, or Not?

E. A. Collier, Oregon, read a paper on the effect of trench-type sections on pavement maintenance. Posing the question, "To trench or not to trench?" he said that first discourages use of a full-width porous base over the entire road. The effects of the trench-type cross-section, he feels, are generally bad. A study of 35 projects showed less than 2% failures when full-width base was provided, as against 52% failure with trench-type section. Concrete should be thickened 4 in. to compensate for the lack of a 12-in. granular base on poor soil.

Montana was cited as one of the states going to the full blanket, using 6 to 10 in. of material under oil-mat roads. Mr. Collier ventured that maintenance costs are 50% more when such a base is omitted, and advocated cutting shoulders away and replacing them to eliminate the trench effect. Oregon has blanketed full-width as standard practice for 12 years.

Equipment Rental Rates

B. W. Davis of North Carolina submitted a report, presented by R. H. Stalnaker of California, urging that state highway departments adopt equipment cost systems which will permit better comparison with commercial operation. Equipment costs should be kept for each force-account operation or job, and a record kept of equipment maintenance cost chargeable to individual jobs. More definite rules are needed as to what items, such as renewal of blades, should be considered operating expense. And the departments must include interest on investment and some uniform and valid method of charging equipment off. Rates should also consider major and minor repair costs, oils and greases, fuel, depreciation, storage and insurance.

California "Collier Report"

G. Donald Kennedy, Automotive Safety Foundation, discussed the much-publicized "Collier Report" on California's highways, streets and bridges, a fact-finding document pre-

pared for the state legislature. One of the most comprehensive analyses of highway need ever made, this report reveals that California's population is growing much more rapidly than the national average; traffic has increased 26% since 1941; the state now has 3,125,000 motor vehicles, or over 10% of the national total. This report, together with an exhaustive analysis of taxation for highway purposes and a separate proposal of a system of highway financing, will be used as a basis for special session legislative consideration of highways in 1947. Hence, this state, which not so long ago saw failure of a legislative proposal to build a bold state-wide system of freeways, is expected to be the scene of continued brilliant highway expansion. Recommendations call for retaining the present set-up of highway authority, although any plan adopted for the state will likely consider all classes of highways.

In a following discussion, H. S. Fairbank, PRA, touched on the broad purposes of the state-wide planning surveys as initiated by PRA some years ago. He said that the California report, which utilized planning data, is significant because it deals with streets and highways as a whole system and relates highway needs with other facts to produce means of obtaining objectives. This new type of research, throwing the searchlight on dynamic highway use, is in contrast with old-time emphasis on merely physical engineering problems dealing only with the static roadbed.

Secondary Road Planning

A Kansas spokesman told of that state's method of designating its secondary federal-aid highway system. The first problem was to properly distribute the mileage between the counties. A 12,000 mile or a 10% system was allocated, the formula being to prorate county mileage on a basis of county area, number of farms, taxable non-urban property, and mileage of roads off the state system. Crop rather than land valuation was mentioned as being an important factor in deciding allocations of this kind; crops often are quite valuable in relation to land prices. Rural road destination studies in Kansas and Missouri were also mentioned.

Texas procedure in mapping out a secondary federal-aid road program was told by State Highway Engineer D. C. Greer. In following out the terms of the Federal Highway Act of 1944, the question often was whether to cooperate with the local wishes of individual counties or to decide road designations purely on a basis of sur-

vey facts. The proposed 50-50 federal-state fund of \$60,000,000 was first converted into a theoretical total mileage based on \$8,000 per mile assumed construction cost. Then this mileage was broken down into 25 highway district programs, using the original federal-aid mileage formula, after which individual county allocation was decided somewhat on a judgment basis rather than a rigid formula, to meet the actual need. The highway officials went to the county courts to hear local ideas, and where the survey facts differed, attempted to sell local people on the wisest procedure. Fully 90% of the allocations thus made were considered entirely sound from an engineering viewpoint.

Portland Traffic Studies

Urban parking and other traffic problems are being analyzed for Portland, Oregon, by the state highway department in cooperation with local officials, financed by \$36,000 federal, \$24,000 state and \$10,000 city funds. In describing this work, R. H. Baldock, state highway engineer, pointed out that while the ultimate objective is to get a factual basis for a \$50,000,000 expressway system, the most urgent immediate need is to get better utilization of existing surface streets now. A one-way street traffic gridiron is being considered. Cities must employ the power of condemnation when necessary to get proper parking space, he said. Intelligent routing of traffic and creation of better traffic terminal facilities downtown will go a long way toward relieving congestion with a small amount of money.

AASHO Resolutions

At the close of the December Los Angeles meeting, the AASHO passed a number of resolutions—mostly aimed at Congress—urging enactment of measures to extend for 12 months the period of availability of federal-aid funds; allocation of war surplus equipment to the states on a percentage basis; further completion of the Inter-American highway from this country to Panama; and lifting of all remaining wartime restrictions on construction machinery manufacture and distribution.

Urban Traffic Increases—Traffic counts made in seven large cities in December, 1946, showed the following percentage increases over traffic volumes in December, 1945: Chicago, 30.3%; Columbus, Ohio, 22.8%; Detroit, 4.5%; Duluth, 3.3%; St. Louis, 23.6%; Santa Fe, 32.4%; Washington, D. C., 21.5%.



★ Autumn road re-shaping. A rear-end belt loader attached to a motor grader keeps the dump trucks coming up, picking up sod and earth bladed onto the roadway in reshaping shoulders and ditches

Winter Maintenance

Methods in Michigan Counties

Graveling in Macomb County

GRAVELING is a year-around operation in Macomb County, Michigan. The onset of winter sees a stepping up rather than diminishment of this work, in an effort to get all county road surfaces and pavement shoulders in best possible condition for going through winter and spring.

Road graveling in this county is geared to two portable crushing and screening plants, which are moved about between some dozen pits to minimize hauling. These pits, located along an ancient lake shore line, also yield gravel for black-topping work. One plant is getting along in years, and an old Best tractor, which is a grandpappy for sure, hums away to keep it running. Meantime since autumn, 1946, the county has worked

several pits with a new modern portable plant. More new equipment is contemplated. About 100,000 c. y. gravel was processed in 1946. Macomb County maintains 1,158 miles of rural roads plus 180 miles of subdivision streets in the unincorporated northern fringes of suburban Detroit from state gas tax. Michigan's famous (or infamous) "McNitt" act throws all township roads on the county and allows approximately \$75 per mile for state aid, thus necessitating a nice job of fund stretching. There are 110 miles of black top roads in the county, and 116 miles of concrete; the rest are gravel.

Resurfacing Program

Last year on resuming somewhat normal operations, the county began

a county-wide resurfacing program. Many miles have been built up with additional gravel of varying tonnage per mile. The county has begun to use liquid calcium chloride in a 40% solution as an aid to gravel road stabilization, having treated all major county roads in the past year.

Crushed gravel is specified for all road graveling and patching except for minor patching, the county board having ruled thusly to eliminate over-size stones that roll out under traffic.

During October and November the entire output of the two crushing plants was directed to stockpiling and to improvements that would fortify the roads for winter and spring. At this season crusher output not taken directly for patching is stockpiled along the road near each pit. Low spots in the road and rutted shoulders are filled by tail-gating gravel and blading out with under-body blades

Winter and spring maintenance begins in autumn in northern states such as Michigan. Following the article on Macomb County, Michigan, which was

staff-written after a visit one day last November, we present summaries on this subject from a selection of Michigan County highway engineers.

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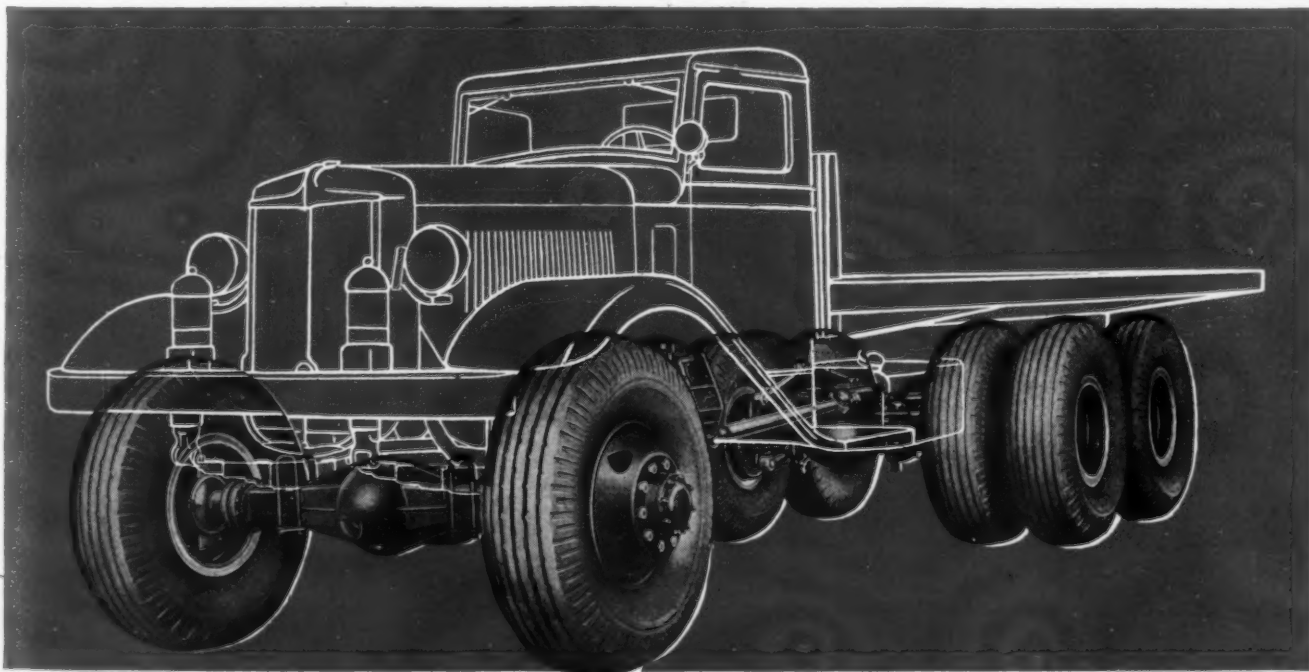
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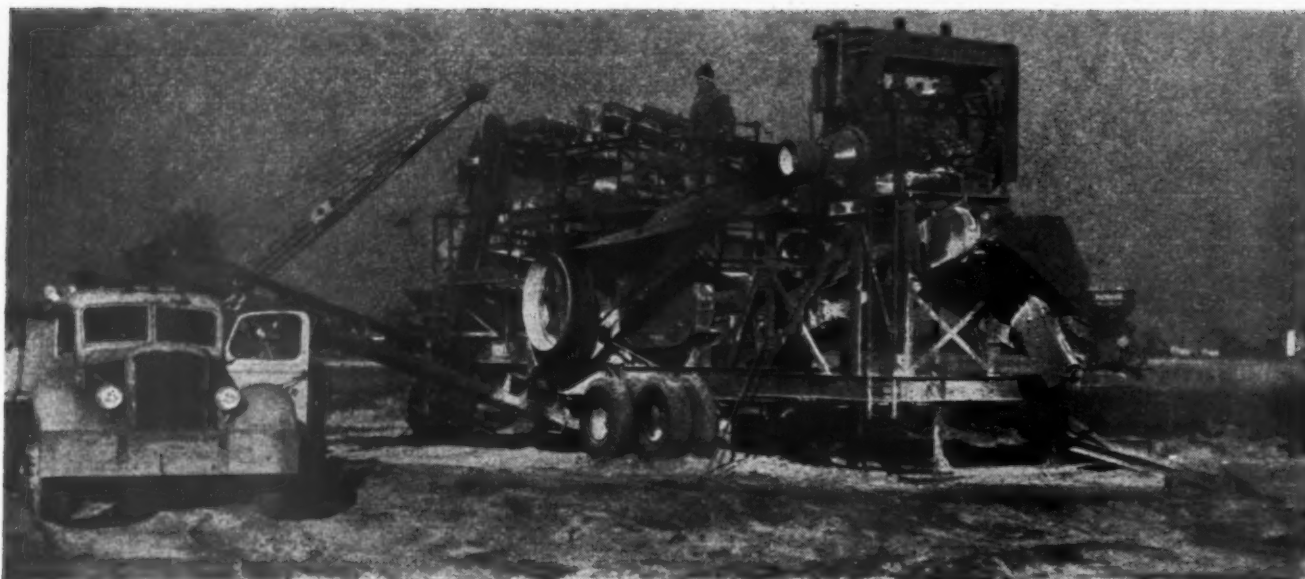


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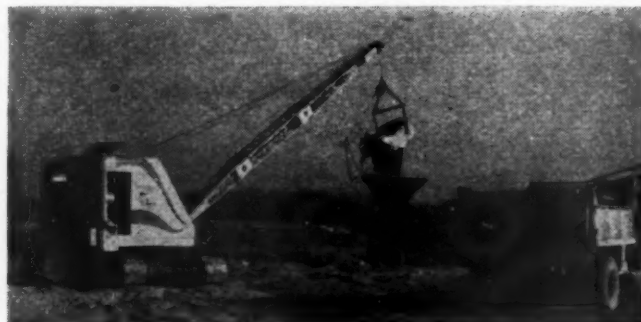




★ Macomb County's new portable crushing and screening plant, which worked several pits for stockpiling and late-season graveling through the past autumn



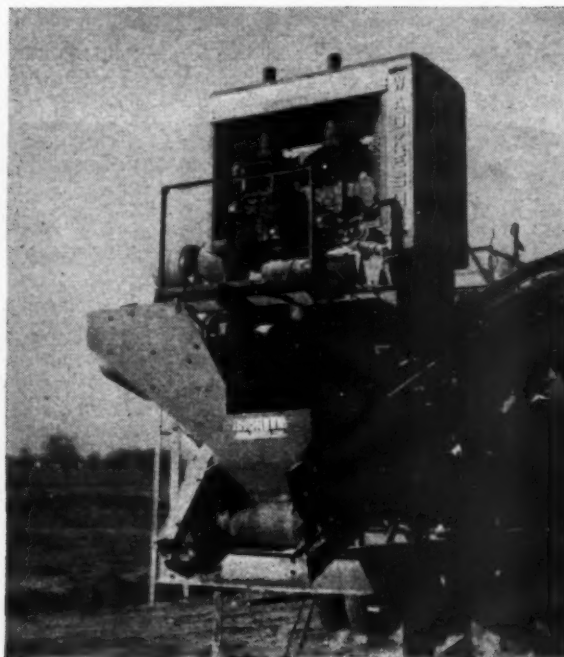
★ All new trucks have the same make of dump body. This truck is loading for a 300-ft. run to a roadside stockpile being built up for spring maintenance



★ At the portable hopper end of the new aggregate plant—a 1/2-yd. dragline



★ (Upper left): 15-year-old crushing plant, still going strong in Macomb County, Mich., aided by an old Best tractor. (Lower left): The County prefers 2 1/2-ton dump trucks for general maintenance. Many of them are equipped with under-body blades. The driver



here has just finished using the blade to skin down the gravel under the hopper, so that clearance would be maintained under the spout. (Right): The aggregate plant's business end—the motor conveniently accessible for starting, stopping and reversing.

carried on some of the trucks. Low crown is reshaped on some sections, this work being combined often with recutting of ditches that had become clogged with weed growth or filled with mud. Loose earth and sod thus worked up out of the ditches is picked up and hauled to dumping points in trucks, using, among other equipment, a belt-type power loader attached to the rear end of a motor grader as shown in an accompanying photograph. A pulverizing type power soil mixer is used for mixed-in-place road processing and for cutting down sod shoulders.

Lighter Trucks Preferred

Truck hauling is one of the big cost items in the county, and costs are watched carefully. Costs average about 5 cents per truck-mile. The county has an excellent truck fleet, including a dozen new end-dump units. Smaller 2½-ton trucks are preferred, since they get around better in all kinds of going, permit more flexible organization of work, and do less damage to soft roadbeds.

One heavy four-wheel-drive truck is used for snow-plow and other special work. Lighter trucks can be used, in the main, however, since this area in southeastern Michigan is not in the heavy snow belt.

The big headache in winter, hence, is not heavy drifting but ice conditions. A 2-in. fall in this metropolitan fringe area is more trouble than a 20-in. fall up north. Sanding work is highly organized, with quick action the watchword. Beginning Nov. 1 the county maintains a night patrolman, who sees that sand piles are ready, with salt already mixed, and who gets to the phone the minute trouble is in sight.

The county also put down about 9 miles of asphaltic concrete resurface and 12 miles of bituminous road mix during 1946. The asphaltic concrete was mixed in a county-owned portable 300-yd.-per-day plant, some of the sections involving an 18-mile haul. Costs for a 2½-in. resurface averaged \$.60 per c.y. The principal precaution in hot-mix work is to secure a very dense mix, rather high in fines.

The county has gone in for oil-aggregate mix in the past, but is gradually turning to heavier bituminous construction in the belief that it costs little more to begin with and pays in the long run because of greater durability.

K. O. Brink is county highway engineer and Robert Rosso, maintenance superintendent for the Macomb County road commission, of which Roy Conner is chairman.

Ruts Ironed before Freeze-up

By L. F. Levin

County Engineer, Chippewa County,
Sault Ste. Marie, Mich.

WE PRODUCE 40 to 60 thousand cubic yards of crushed gravel each season for general road maintenance. Coarse sand such as is screened out of washed gravel for aggregate is used for sanding purposes, being best used with calcium chloride. We generally start about Oct. 20 to stock sand, erect snow fence, and remove summer equipment from rolling stock so plows and oversized wheels and tires can be placed on trucks. Large single wheels are best for snow removal instead of regular duals.

The trucks are given a general going over to prepare them for warm operation through the winter months. This includes tire and tow chains,

shovel, alcohol for emergencies—no anti-freeze is normally used as the equipment boils it away.

Roads are kept well maintained in the fall so that when the freeze comes they will be as smooth as possible, otherwise we would wear out the bottoms of the plows in no time.

Shoulder markers are placed at culverts, corners and frequently in all open spaces to mark the edge of the road in a storm and to keep plows from going out too far. We use maple saplings as they bend over and fly upright as the plow passes on.

We plow about 450 miles of county road and the state about 160 miles. Our average cost is about \$110 per mile and we have about 80 inches of snow. However, most of our trouble is not the snow fall but drifting snow.

A West-Michigan County's Procedure

By Carl T. Bowen

Engineer, Manager, Ottawa County,
Grand Haven, Mich.

A BIG range in temperatures and snowfall occurs from the south to north in our locality, and the influence of the Great Lakes on both temperature and snowfalls makes more sudden changes in our winter maintenance problem. Ottawa County maintains 100 miles of trunk and 1,365 miles of county roads.

The shoulders of the highway should be smooth and sloped to drain at all seasons, but more particularly in winter. A frozen rut is much more dangerous than a rut that is not frozen. High shoulders prevent water from draining off, and in winter ice, if formed on the road surface, finds its way through cracks and joints to the subgrade to cause frost heaves. Shoulder work and crack filling both serve to prevent frost action under the pavement.

Snow Fence Tricky

The erection of snow fences in the proper place to do the most good is not as simple as it may appear to road users. For economic reasons it is not practical to place snow fence permanently. Practice is to keep a log of the locations where we have determined from experience that the fences do the maximum good. The contour of the land and even a change

in the crop on the land affects fence locations. A heavy growth of weeds or standing corn stalks serve to eliminate need of fences. Standard practice is to place fence 100 ft. from the center of the highway.

Fence is supported by substantial steel posts, usually heavier than required for farm fences. The fence is fastened to each post with wire ties. In some instances, the fence is lifted on the posts after a drift is formed as high as the fence, but we seldom raise any fence in this area.

Our prevailing winter winds are west and northwest, but occasionally we have a late snow in March from east or northeast, and of course, fences are then of no value. We have been using fence in Ottawa County over 20 years and some of the original fence is still in use. Wire breakage is worse than loss of slats or pickets. All snow fence here is on private property. All property owners are contacted for this privilege, and refusals are negligible.

First Use of Salt

We use an average of 125 tons of chloride per year. This is our first year to use any salt for ice control. This is because the most satisfactory results are obtained by using raw salt without an abrasive, and until recently salt has been recommended for bituminous surfaces only.

Our most available abrasive is coarse sharp sand. Cinders are not available and blow sand from the nearby lake dunes is no good. Blow sand has rolled so long there are no sharp edges left on the particles. Stock piles are made at strategic points in the county consisting of approximately 100 lb. of flake chloride per cubic yard, of sand previous to freezing weather. Better results are obtained when damp sand is used. When this material is loaded for use approximately 200 lb. of flake chloride is spread evenly over the load of sand.

We use several rotary type sanders and get very satisfactory results by spot sanding using a No. 2 shovel. When ice first forms, that is, new ice or sleet or packed light snow, we first treat such places as railroad crossings, intersections, hills and curves, and follow by treating the entire road. Under extreme conditions, a road may be sanded and bladed clean four or five times in one day.

Underbody Scrapers

Except for an occasional trucker, very little use is made of sand placed in sacks or barrels along the highway. Most of such emergency material is spread by county employees not operating regular equipment. As soon as enough snow falls to conceal the edge of the pavement we start removal with under-body scrapers. These are fast moving and can handle the situation until there are several inches of snow. The windrows, if any, are disposed of by light one-way plows that throw the snow beyond the shoulders of the road. As a storm continues heavier equipment is used. We have 18-one-way plows, 35 "V" plows, 3 with one wing and 6 with two wings, 10 underbody truck scrapers and 7 motor graders with "V" plows, also eight so-called snow wings, four mounted on heavy trucks and four mounted on motor graders. Except for the plows, all the above equipment is used for other purposes.

The estimated total cost is close to \$300,000. The percentage of highway funds spent on winter maintenance varies each year, but has been as low as 10% on county roads to 40% on state trunklines in Ottawa County. The snow removal policy of this county is to begin with the storm on the most important roads, and while the storm lasts not plow on more miles of road than can be kept open. When the storm abates, the balance of the roads, if any, can be taken care of. We do not contract any work in connection with winter maintenance except production of abrasives.

Tree Plantings Save Fence

By H. F. Larson

Engineer-Manager, Iron County Road Commission, Crystal Falls, Mich.

When winter sets in up here, it used to be the rule to lay off most of the crew and tell them: "We'll see you in the spring." But as time went on this was all changed.

The preparation for winter maintenance really takes place all the year around. There are snow plows to repair, sanding machines to be put in good working order. Most important of all is the checking and overhauling of heavy equipment, as winter work is hard on these units.

Late in the summer, weeds and small brush are cut along the roadside to prevent drifting of snow, which is an important factor in helping to keep the highways snow-free.

In Iron County we have kept snow fence footage to a minimum by purchasing roadside timber, buying wide rights-of-way, to encourage the natural growth of trees. This program has been supplemented by planting pines and evergreens. It's

the constant drifting that troubles us—not the actual snow fall.

While the erection of snow fencing is going on, large stockpiles of chloridized sand are placed at strategic locations throughout the county. The sanding of our many hills, etc., during the winter has become more important than ever, due largely to the use of synthetic tires, which are very unsatisfactory for winter driving.

Common salt is also used and is very effective for the prevention of ice and snow mats. We aim to keep our highways snow and ice free; in other words, just as bare as in the summertime.

There are times during the winter when the crews are not busy with winter maintenance. We then put them to work hauling gravel from summer stockpiles to our secondary roads. In addition, there is the roadside clean-up, such as tree-trimming, the cutting out of brush and small trees is done, which makes good winter work.

With this progressive schedule of year-around work, there no longer is occasion to lay off the crew in the fall.

Another Modern Crusher

By Glenn C. Montjoy

Superintendent, Cheboygan County Road Commission, Cheboygan, Michigan

WITH reference to ice treatment abrasives, sand is used that is surplus and removed from our crusher when making $\frac{3}{4}$ in. crushed gravel, this being a very sharp sand and satisfactory for this work when mixed with chloride and salt. We stock pile approximately 2,500 c. y. in the fall with chloride and salt, and place in various locations in our county. About 1,000 sacks of salt and 2,500 sacks of chloride are required annually.

Patching of our roads annually takes 30,000 c. y. of $\frac{3}{4}$ -in. crushed gravel, this amount including shoulder correction and roadbed coverage. Gravel is produced in county-owned pits by a modern portable tandem crusher. Estimated cost for this type of work is \$35,000.

Immediately after it starts to snow and storm, trucks with under-body blades and motor graders remove the snow from the roadbed or travelway. These are followed by $1\frac{1}{2}$ -ton trucks

with sand spreaders. Snow that is windrowed to shoulder is then removed from shoulders by one-way and V-type plows, followed by heavy trucks and motor patrol graders with side wings that slope snow banks and allow high winds to blow a portion of the snow into the fields.

We also have a definite work schedule starting about Oct. 15. All snow fence posts are driven by motor driven post driver, mounted on a $1\frac{1}{2}$ -ton truck. An attempt is made to allow posts to freeze in the ground before hanging fence. This keeps our fence in good alignment and we do not have to duplicate some of the work by rehanging fence due to heavy winds before posts are frozen in ground.

Three roadside mowers in use have a bearing on winter conditions. All roadsides are cut during June, July, August and September.

Following is a list of Cheboygan County's equipment:

4 pickups, 9 heavy trucks, 3 medium trucks,
8 light trucks, 3 mowers, 4 graders, 20 snow plows,
1 crusher, 1 shovel and 1 bulldozer.

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State Highway Construction 1946-'47

Reports from officials showing mileage completed and expenditures in 1946, uncompleted contracts carried over and probable construction in 1947

New England States

Maine

Only 3.65 miles of state highway were completed in 1946. However, uncompleted contracts estimated to cost \$3,536,854 were carried over to 1947. The new construction program for the present year had not been determined. Details of the uncompleted contracts follow:

Uncompleted Contracts Carried Over to 1947

	Miles	Est. Cost
Bit. concrete	8.51	\$ 819,530
Bit. penet.	14.3	580,639
Mixed bit.	27.68	1,536,685
Bit. surf. treat.	26.2	600,000

New Hampshire

A total of 29½ miles of state highway was completed in 1946 at a cost of \$570,000. Uncompleted contracts calling for an estimated expenditure of \$1,632,000 were carried over to 1947. One of the principal items in the 1947 program calls for the construction of 20 budgets at an estimated cost of \$2,000,000. Details of 1946 and 1947 work follow:

	Miles	Est. Cost
Bit. surf. treat.	26.95	\$ 340,000
Mixed bit.	1.6	122,000
Bit. concrete	1.2	108,000
Bridges, 8		271,000

Uncompleted Contracts Carried Over to 1947

	Miles	Est. Cost
Mixed bit.	4	\$ 274,000
Bit. surf. treat.	13.9	563,000
Bridges, 3		795,000

Proposed State Highway Construction for 1947

	Miles	Est. Cost
Bit. surf. treat.	30	\$ 500,000
Mixed bit.	15	900,000
Bridges, 20		2,000,000
Grade cross. sep., 3		400,000

Vermont

State highway contracts estimated to cost \$494,100 were completed in 1946, and uncompleted contracts estimated to cost \$2,086,000 were carried over to this year. Some details of the work are given in the tabulations.

State Highway Mileage Completed in 1946

	Miles	Est. Cost
Graded and drained....	6.6	\$ 58,900
Bit. surf. treat.	15.2	105,000
Mixed bit.	0.3	44,200
Bit. concrete	19.8	286,000

Uncompleted Contracts Carried Over to 1947

	Miles	Est. Cost
Graded and drained....	13.9	\$ 102,100
Bit. surf. treat.	7.9	264,500
Mixed bit.	19.0	1,719,400

Massachusetts

Over 30 miles of state highway were completed in 1946 and uncompleted contracts covering 37.7 miles of highway were carried over to 1947. The new construction program for this year calls for an estimated expenditure of \$12,500,000. Some details follow:

State Highway Mileage Completed in 1946

	Miles	Est. Cost
Bit. surf. treat.	12.0	\$ 22,995
Bit. penet.	16.9	979,395
Bit. concrete	2.3	197,661
Bridges, 1		221,203
Grade cross. sep., 1....		105,096

Uncompleted Contracts Carried Over to 1947

	Miles	Est. Cost
B. M. A.	19.8	\$3,625,527
Bit. concrete	9.6	1,308,471
Reinf. cement concrete	5.2	1,201,178
Graded and drained....	3.1	1,391,175

Proposed State Highway Construction for 1947

	Miles	Est. Cost
Bit. penet.	21.4	\$3,000,000
Bit. concrete	9.3	1,290,000
P. C. concrete	1.2	5,860,000
Grade cross. sep., 10....		2,350,000

Rhode Island

State highway completed in 1946 comprised 16 miles of sheet asphalt estimated to cost \$1,000,000. Decision on the over-all construction program for this year has been delayed pending traffic studies in progress and approval by governor and legislative action on funds.

Connecticut

State highway completed in the fiscal year 1945-6 amounted to 10 miles. Uncompleted contracts carried over to 1947 included 132 miles of all types of surface, estimated to cost \$7,620,000 and 25 bridges estimated to cost \$2,678,000. The proposed construction program for 1947 calls for an estimated expenditure of \$18,979,500. The work includes a 1-mile tunnel estimated to cost \$1,000,000 and 25 bridges estimated to cost \$4,376,000. The tabulations below give some details of the work.

State Highway Mileage Completed in 1945-6 Fiscal Year

	Miles	Act. Cost*
Graded and drained....	1.23	\$ 65,784
Gravel surf. ....	.35	28,425
Bit. penet. ....	.33	19,790
Bit. concrete ....	.58	48,999
P. C. concrete.....	7.65	1,312,780
Bridges, 2		165,480

*Includes cost, land, engineering, contract, etc.

Proposed State Highway Construction for 1947

	Miles	Est. Cost
Graded and drained....	12.1	\$3,653,000
Gravel surf.	91.0	5,010,000
Bit. penet.	9.0	975,000
Bit. concrete	1.1	185,000
P. C. concrete.....	27.5	4,215,500
Bridges, 25		4,376,000
Grade cross. sep., 9....		1,565,000
Tunnel	1	1,000,000

Middle Atlantic States

New York

While in 1946 only 66.39 miles of state highway, estimated to cost \$12,685,199, were completed, the uncompleted contracts carried over to 1947 covered 423.42 miles of highway, estimated to cost \$54,026,063. In addition, grade crossing contracts estimated to cost \$831,732 were carried over. The proposed highway construction program for 1947 calls for an expenditure of \$211,123,180. Of this \$185,986,300 is for the construction of highways, throughways, parkways and city arterial, and \$25,136,880 for grade crossing eliminations.

New Jersey

The legislature, which convened in January, has been requested to appropriate \$42,770,000 for the fiscal year 1947-48. Of this sum \$35,130,000 will be requested from motor vehicle license fees and gasoline taxes and the \$7,375,000 remaining in a bond issue previously approved by the electorate. From motor vehicle funds also \$265,000 will be sought for replacing bridges over the old Delaware and Raritan Canal.

In this total will be \$10,000,000 for additional work on the Freeway and \$7,700,000 for the Parkway. The bond money will be used for bridges, two of which are estimated to cost \$2,500,000 each.

For the fiscal year 1945-46, the state highway department construction program represented \$16,783,140 and for the fiscal year 1946-47 it is also \$16,783,140.

Pennsylvania

The total expenditure for state highway construction, reconstruction, resurfacing and widening for 1946 amounted to approximately \$35,000,000 out of a total program of approximately \$66,000,000. This means that approximately \$30,000,000 was carried over until 1947.

There are sufficient funds available, both state and federal, to put under way a program of approximately \$107,000,000 in 1947, making a total program for 1947, including the carry-over, of \$137,000,000. It is impossible to state at this time how much of this work can be placed under way or how much will be expended in 1947.

East North Central States

Ohio

State highway mileage completed last year included 2,035 miles of bituminous surface treatment at a cost of \$2,831,000, 323 miles of bituminous concrete costing \$5,960,000 and 7½ miles of graded and drained road at a cost of \$1,590,000. Uncompleted state highway contracts, estimated to cost \$13,874,000, were carried over to 1947. Details of 1946 and 1947 work follow:

State Highway Mileage Completed in 1946

	Miles	Est. Cost
Graded and drained....	7.5	\$1,590,000
Gravel surf.	117	98,000
Bit. surf. treat.	2,035	2,831,000
Bit. concrete.....	323	5,960,000
P. C. concrete.....	18.5	3,337,000
Bridges, 37		857,000

Uncompleted Contracts Carried Over to 1947

	Miles	Est. Cost
P. C. concrete.....	51	\$10,174,000

Bit. concrete	113	3,700,000
Bridges, 39		2,050,000

Proposed State Highway Construction for 1947

The following is for Federal aid projects only:

	Miles	Est. Cost
High type pav. & struc.	150	\$15,000,000
Med. type pav. & struc.	120	4,000,000
Low type pav. & struc.	65	1,300,000

Indiana

A total of 584 miles of state highway improvement was completed last year. Of this 327 miles were bituminous surface treated. Uncompleted contracts estimated to cost \$20,665,256 were carried over to 1947. The proposed new construction program for this year calls for an estimated expenditure of \$26,182,152. Details of the 1946 and 1947 work follow:

State Highway Mileage Completed in 1946

	Miles	Est. Cost
Stone or gravel surf. ..	18.07	\$ 761,659
Bit. surf. treat.	327.05	626,652
Mixed bit.	4.36	32,226
P. C. concrete.....	20.42	1,415,977
Other asph. surf.	214.42	3,868,693
Bridges, 25		620,015

Uncompleted Contracts Carried Over to 1947

	Miles	Est. Cost
Graded and drained....	9.46	\$ 962,558
Stone or gravel surf. ..	44.34	1,696,385
Bit. surf. treat.	5.33	320,424
Mixed bit.	5.79	53,648
P. C. concrete.....	93.74	8,886,204
Other asph. surf.	266.21	6,063,455
Bridges, 49		2,610,065
Grade cross. sep., 1....		72,517

Proposed State Highway Construction for 1947

	Miles	Est. Cost
Graded and drained....	23.06	\$1,982,000
Stone or gravel surf. ..	40.90	2,343,800
Bit. surf. treat.	386.73	1,338,359
Bit. penet.	7.77	69,181
P. C. concrete.....	129.55	14,425,348
Other asph. surf.	327.63	7,423,469
Bridges, 62		6,850,000
Grade cross. sep., 9....		1,750,000

Illinois

Contracts amounting to \$14,032,000 were let in 1946 by the State Division of Highways, and contracts estimated to cost \$12,398,817 were completed in that year. Details of this construction and of the uncompleted contracts carried over to 1947 follow:

Construction Completed During 1946

	Miles	Est. Cost
Ditch clean. and drain.	94.7	\$ 229,522
Grav. or crush. sto. surf.	1.7	67,271
Bit. mats and seal cts.	183.7	774,083
Bit. concrete (hot-mix, rigid base)	120.1	3,438,778
P. C. concrete.....	53.7	4,514,695
Patching—P.C.C. pav., sq. yd.	166,420	1,543,903
Break., rem., crush.—P.C.C. pav.	22.4	112,073
Bridges, 12		1,184,715
Grade cross. sep., 1....		65,376
High. grade sep., 2....		108,951
Bridges rep. or wid., 10		98,684
Bridge painting		110,862
Miscellaneous		149,924

Uncompleted Contracts Carried Over to 1947

	Miles	Est. Cost
Ditch clean. and drain.	39.2	\$ 104,890
Grav. or crush. sto. surf.	21.4	625,947
Bit. mats and seal cts.	43.5	377,450
Bit. concrete (hot-mix, rigid base)	36.7	1,143,536
P. C. concrete.....	29.4	2,207,335
Patching—P.C.C. pav., sq. yd.	41,286	406,077
Break., rem., crush.—P.C.C. pav.	39.5	289,000
Bridges, 29		3,045,225
Grade cross. sep., 4....		338,366
Bridges rep. or wid., 2....		22,553
Bridge painting		43,264
Miscellaneous		208,222

Michigan

State highway construction costing \$7,650,000 was completed in 1946 and uncompleted contracts estimated to cost \$14,545,000 were carried over to this year. The construction program for 1947 calls for an expenditure of approximately \$25,000,000. The following tabulations relate to the completed work and the uncompleted contracts:

State Highway Mileage Completed in 1946

	Miles	Est. Cost
Graded and drained....	57	\$1,900,000
Gravel surf.	26	730,000
Bit. surf. treat.	135	200,000
Bit. concrete	106	2,000,000
P. C. concrete.....	42	2,560,000
Bridges, 7		265,000

Uncompleted Contracts Carried Over to 1947

	Miles	Est. Cost
Graded and drained....	40	\$2,000,000
Gravel surf.	10	470,000
P. C. concrete.....	93	8,640,000
Bridges, 32		2,935,000
Grade cross. sep., 1....		500,000

Construction for 1947

Speaking generally, the construction program for 1947 will consist of the patching, widening, and resurfacing of existing pavements and the construction of as much new pavement as is possible under present conditions. New pavement construction will be confined largely to the reconstruction of those highways that can no longer be maintained economically and to those that are so obsolete that they are hazardous to traffic.

Every attempt will be made to obligate by contract the funds available under the Federal-aid Highway Act of 1944 for the first postwar fiscal year, because these funds will lapse on July 1, 1947, unless the time limit named in the Act is extended by Congress.

The extent to which the whole program can be executed will depend upon whether the bid prices received are reasonable and whether labor, material, equipment and transportation conditions improve during the early part of 1947.

Wisconsin

State highway completed in 1946 included 73 miles of portland cement concrete at a cost of \$3,000,000, and 47 miles of grading and base course on bituminous surfacing contracts. The bituminous surfacing is to be done in 1947. The following tabulation of the 1946 work includes all construction done under contract classified by highest surface type included in each contract (based on contract amounts). State highway mileage completed in 1946:

	Miles	Est. Cost
Graded and drained....	73	\$1,750,000
Gravel surf.	13	420,000
Stone surf.	45	800,000
Mixed bit.	7	140,000
Bit. concrete	21	645,000
P. C. concrete	73	3,000,000
Sheet asph.	0.8	150,000
Bridges, 6		650,000
Grade cross. struc., 1.		25,000

Uncompleted Contracts Carried Over to 1947

(Classified by highest surface type included in each contract)

	Miles	Est. Cost
Structures, 32		\$ 700,000
Concrete surf.	7	500,000
Bit. surf.	47	900,000
Grav. and crush. stone surf.	33	1,000,000
Graded and drained....	37	1,400,000

Proposed State Highway Construction for 1947

(Mileages contain duplication, Monies do not)

	Miles	Est. Cost
Graded and drained....	397	\$7,800,000
Gravel surf.	59	700,000
Stone surf.	140	2,000,000
Bit. surf. treat.	17	100,000
Mixed bit.	269	3,000,000
Bit. concrete	25	800,000
P. C. concrete	155	4,000,000
Sheet asph.	1	200,000
Bridges, 73		2,000,000
Grade cross. sep., 2....		200,000

West North Central States

Minnesota

State highway completed in 1946 included 240 miles graded and gravelled road costing \$4,200,000; 230 miles mixed bituminous surface, costing \$2,300,000; 100 miles portland cement concrete at a cost of \$4,000,000; 25 miles of pavement widening cost \$350,000; and 5 bridges at a cost of \$40,000.

The uncompleted contracts carried over to 1947 comprised 153 miles of grading estimated to cost \$3,200,000; 35 miles gravel base and mixed bituminous surface to cost \$240,000 and 22 miles of pavement widening estimated to cost \$430,000.

The proposed construction program for 1947 is as follows:

	Miles	Est. Cost
Grade and gravel....	477	\$10,000,000
Mixed bit.	220	2,500,000
P. C. concrete	90	4,500,000
Bridges, 27		500,000
Grade cross. sep., 9....		2,500,000
Pav. widen.	85	1,700,000

Iowa

The total expenditures for state highway completed in 1946 was \$9,-

616,495. The work included 473 miles graded and drained road, 379 miles of gravel and stone surface, 42 miles of bituminous penetration road, 68 miles portland cement concrete and 1,750 bridges and culverts.

Work now under contract and carried over for 1947 completed for which \$8,792,510 is obligated, includes the following: Grading, 202 miles; gravel and stone surfacing, 287 miles; stabilized base, 26 miles; bituminous surfacing, 29 miles; concrete paving, 38 miles.

It is anticipated that the 1947 new construction program will call for an expenditure of approximately \$20,-000,000.

North Dakota

A total of 148 miles of state highway was completed in 1946, the work involving the following items:

	Miles	Est. Cost
Graded and drained....	75	\$ 600,000
Grav. surf.	15	40,000
Bituminous	52	883,000
P. C. concrete	6	255,000
Bridges, 19		416,000

Uncompleted Contracts Carried Over to 1947

	Miles	Est. Cost
Asphaltic concrete	12	\$ 142,000
Stab. grav. & bit. surf.	17	306,000
Grading	85	1,235,000
Structures		577,000

The 1947 construction program had not been decided at the time this report was made.

South Dakota

The estimated total expenditure on 1946 construction was \$2,509,577, of which \$1,831,100 was for the uncompleted contracts, estimated to cost \$4,643,307, listed below. The highway work completed in 1946 was as follows:

	Miles	Est. Cost
Graded and drained....	50	\$ 469,117
Grav. surf.	29	33,712
Mixed bit.	9	72,442
Bridges, 8		103,195

Uncompleted Contracts Carried Over to 1947

	Miles	Est. Cost
Graded and drained....	187.4	\$2,345,982
Grav. surf.	113.1	205,435
Bit. surf. treat.	38.6	445,267
Mixed bit.	98.8	820,314
Bit. concrete	6.5	77,163
P. C. concrete	14.8	599,293
Bridges, 9		149,849

Proposed State Highway Construction for 1947

	Miles	Est. Cost
Graded and drained....	124.1	\$1,305,000
Grav. surf.	112.6	204,500
Bit. surf. treat.	168.5	2,022,000
Mixed bit.	145.6	1,310,000
Bit. concrete	15.7	173,000
P. C. concrete	34.6	1,744,000
Bridges, 13		383,000
Grade cross. sep., 1....		250,000

Nebraska

State highway construction of a total contract value of \$8,404,500 was let in 1946. This work was about 80% completed last year, leaving 20% to be done this year on a majority of

contracts. The work contracted in 1946 was as follows:

	Miles
Graded and drained....	330
Grav. surf.	78
Bit. surf. treat.	124
Mixed bit.	148
Bit. reconstr.	147
P. C. concrete....	49
Bridges, 49	

No definite construction program had been formulated at the time this report was made. However, it is expected there will be a \$12,000,000 program. New construction will be about the same types as in 1946, except there will be less concrete and some blacktop resurfacing of old concrete, and if structural steel is available, additional 5 or 6 viaducts and same amount large bridges 200 ft. to 400 ft. long.

Kansas

The following tabulation summarizes the status for this construction program:

Started 1946 with carryover of approximately	\$ 4,000,000
Contracts awarded in 1946, approximately	24,500,000
Amount earned on contracts in 1946, approximately	13,300,000
Amount of carryover into 1947, approximately	15,200,000
Estimated amount to contract in 1947	27,000,000

State highway including Federal-aid secondary roads completed in 1946 amounted to 963.7 miles, the estimated cost being \$8,563,752. This includes some contracts awarded prior to Jan. 1, 1946. Details of this work follow:

State Highway Mileage Completed in 1946

(Including F.A. Secondary)

	Miles	Est. Cost
Graded and drained....	64.1	\$ 956,438
Grav. or stone surf....	202.1	388,354
Bit. surf. treat.	376.1	1,235,597
Mixed bit.	229.3	2,326,641
Bit. concrete	63.6	1,299,191
P. C. concrete	28.5	1,492,678
Bridges, 22		864,853

Details of proposed 1947 construction program follows:

Proposed State Highway Construction for 1947

(Including F.A. Secondary)

	Miles
Graded and drained....	1,110
Grav. or stone surf....	1,420
Bit. surf. treat.	50
Mixed bit.	180
P. C. concrete....	85
Sheet asph. (surf. old pav.)....	75
Bridges and grade cross. sep., 130.	

South Atlantic States Delaware

State highway completed in 1946 included the reconstruction of 37 miles of bituminous concrete at an estimated cost of \$1,440,000, reconstruction of a bridge costing \$50,000 and construction of 2 miles of portland cement concrete at a cost of \$160,000. There were no uncompleted contracts.

The proposed 1947 construction program calls for 30 miles bituminous surface treatment, estimated to cost

Running check for over 20 years

THE DRIVERS of every car and truck make their own check of roads built with Ohio Oil Company Asphalts. And their approval is double-checked by Midwest contractors and public officials who have seen how Ohio Oil Asphalts maintain consistent records for long life, economy and minimum repairs.

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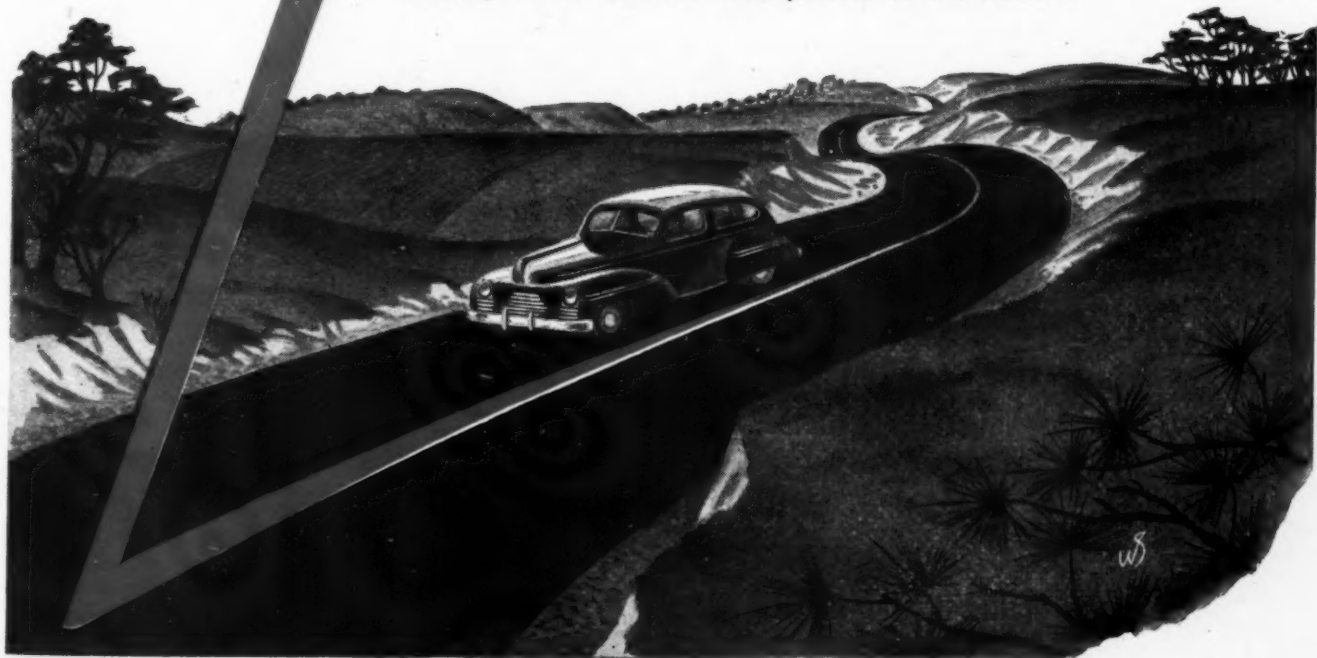
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\$240,000; reconstruction of 95.8 miles of bituminous concrete at a cost of \$3,000,000; construction of 3.2 miles of sheet asphalt at a cost of \$400,000; and one bridge to cost \$30,000.

Maryland

The total construction program for 1946 amounted to \$12,000,000, of which 60% was carried over to 1947. The state highway completed to end of fiscal year (June 30, 1946) involved 657 miles of bituminous surface treatment, 11 miles of portland cement concrete and 91 miles of mixed bituminous, bituminous penetration and bituminous concrete.

The uncompleted work, placed under contract last year, and carried over to 1947, included 26 miles of portland cement concrete, 40 miles of bituminous types and 11 bridges over 50 ft. span.

Proposed state highway construction to be placed under contract in 1947, calls for a probable expenditure of \$12,500,000. It includes 60 miles of bituminous surface treatment, 25 miles of portland cement concrete, 40 miles of mixed bituminous, bituminous penetration and bituminous concrete, and 2 bridges.

Virginia

In all 38 projects calling for 78.2 miles of state highway were completed in 1946, the cost being \$4,535,441. The work carried over to 1947 involved 78 projects of various types estimated to cost \$17,000,000.

It is proposed to put approximately \$40,000,000 worth of construction under way in 1947. The total approximate length of all projects covered by this amount is 950 miles.

The following tabulation gives some details of the work completed last year.

Work Completed During the Calendar Year 1946

	Miles	Est. Cost
W. B. Macadam S. T.	15.7	\$1,645,150
Reinf. conc. surf.	13.1	1,412,150
Pl. conc. surf.	38.3	1,041,163
Graded and drained	4.9	85,873
Grav., cold bit. S. T.	1.4	125,550
Bridges	0.04	32,900
Stab. base S. T.	8.03	80,300
Bit. surf. treat.	3.96	12,000
Soil S. T.	2.44	100,350

West Virginia

State highway completed in 1946 amounted to 21.43 miles, the estimated cost being \$1,145,890. The work included 2.96 miles graded and drained road at a cost of \$187,670; 8.89 miles gravel surface costing \$342,714, 6.42 miles bituminous concrete, estimated to cost \$79,956 and 3.16 miles portland cement concrete costing \$535,550. In addition 6 bridges costing \$79,956 and 1 grade

crossing separation costing \$64,480 were completed.

Uncompleted contracts, details of which are given below, estimated to cost \$5,743,496, were carried over to 1947.

Uncompleted Contracts Carried Over to 1947

	Miles	Est. Cost
Graded and drained	23.27	\$2,585,998
Grav. and stone	33.26	1,854,677
Bit. surf.	8.68	662,857
Concrete	1.79	218,574
Bridges, 5		421,390

Approximately \$16,000,000 is available for the 1947 new construction program.

North Carolina

A total of 904 miles of state highway work was completed in 1946, the projects including the following:

State Highway Mileage Completed in 1946

	Miles	Est. Cost
Graded and drained	27	\$ 533,300
Bit. surf. treat.*	62	597,100
Mixed bit.†	252	2,030,900
Bit. concrete	52	580,100
P. C. concrete	35	1,442,000
Bit. retreat.	476	725,000
Bridges, 10		350,000
Grade cross. sep., 1		52,000

*And soil and stone surface.
†Including sand asphalt.

Uncompleted state highway contracts carried over to 1947 amounted to 367 miles, as shown below:

Uncompleted State Highway Contracts Carried Over to 1947

	Miles	Est. Cost
Graded and drained	79	\$1,756,200
Soil surf.	7	120,600
Bit. surf. treat.*	112	3,250,700
Mixed bit.†	40	527,400
Bit. concrete	12	136,300
P. C. concrete	7	648,700
Bit. retreat.	110	206,600
Bridges, 27, and grade sep., 3		1,630,000

*And soil and stone surface.
†Including sand asphalt.

The tentative construction program for 1947 calls for an approximate expenditure of \$16,125,000 and includes the following:

Proposed State Highway Construction for 1947

	Miles	Est. Cost
Graded and drained	20	\$ 650,000
Bit. surf. treat.*	400	5,600,000
Mixed bit.†	110	2,275,000
Bit. concrete	15	275,000
P. C. concrete	130	4,575,000
Bit. retreat.	480	850,000
Bridges, 60, and grade cross. sep., 13		1,900,000

*And soil and stone surface.
†Including sand and asphalt.

South Carolina

State highway totaling 236.9 miles was completed in 1946 at an estimated cost of \$2,097,000. The work included 223.6 miles of bituminous surface treatment at a cost of \$1,496,117; 5.1 miles of bituminous concrete, costing \$319,563, and 8.2 miles portland cement concrete, costing \$281,835. In addition 8 bridges costing \$402,217 were completed.

Uncompleted state highway contracts as follows were carried over to 1947:

Uncompleted Contracts Carried Over to 1947

	Miles	Est. Cost
Bit. surf. treat.	658.0	\$12,112,200
Earth type	35.3	836,600
Asph. concrete	2.6	549,250
P. C. concrete	8.2	263,490
Bridges		4,285,330

The state highway construction program for 1947 calls for an estimated expenditure of \$15,500,000.

Georgia

State highway department let contracts in 1946 amounting to \$32,000,000 for highway construction. Work costing approximately \$22,000,000 was carried over into 1947. Probable expenditures for 1947 are \$32,000,000.

Florida

Total state highway construction expenditures in 1946 were approximately \$30,000,000. It is estimated that the 1947 expenditures will approximate \$30,000,000.

East South Central States

Kentucky

State highway work completed in 1946 included 778 miles of mixed bituminous, 425 miles of bituminous surface seal and 216 miles of bituminous surface treated. Details of the 1946 work and incompleted contracts carried over to 1947 are given in the tabulations.

State Highway Mileage Completed in 1946

	Miles	Est. Cost
Graded and drained	37	\$1,855,292
Grav. surf.	18	207,572
Stone surf.	78	1,564,299
Bit. surf. treat.	216	425,825
Bit. surf. seal	425	306,817
Mixed bit.	778	3,971,240
Bit. concrete	150	1,503,003
P. C. concrete	1.8	357,280
Rock asphalt	49	354,013
Bridges, 9		688,333
Grade cross. sep., 1		70,470

Uncompleted Contracts Carried Over to 1947

	Miles	Est. Cost
Graded and drained	44	\$1,396,206
Grav. surf.	16	390,995
Stone surf.	52	1,604,357
Bit. surf. treat.	32	47,482
Bit. surf. seal	14	10,829
Mixed bit.	159	1,247,166
Bit. concrete	34	312,486
P. C. concrete	0.5	98,743
Rock asphalt	11	113,927
Bridges, 10		1,122,108
Grade cross. sep., 1		122,791

The construction program for 1947 had not been completed at the time this report was made. However, from the tentative list of projects it appears that approximately the same mileage and types will be constructed this year.

(Continued on page 96)

Sealing Joints

with rubberized asphalt
at the Packard test track



How newly designed equipment and rubberized asphalt were used to provide effective joint sealing as part of special effort to get utmost evenness for 100-mph. traffic; 84,000 ft. of joint sealing in single month

By Bernard Gould

THE resurfacing of the high-speed concrete test track used by Packard Motor Company for automotive testing and experimental runs, proved to be one of the most involved and difficult resurfacing operations of the past year (see "Resurfacing Packard's Famous Test Track," *ROADS AND STREETS*, Nov., 1946). In addition to the precise engineering control required in the actual laying of the concrete, the completion of the job involved newly designed equipment for heating rubberized asphalt connected with the joint sealing operations of the roadway.

100 mph. With Hands Off the Wheel

The special 2½-mile circular track, at the company's proving grounds near Utica, Mich., is so constructed that test drivers have their choice of super-elevations for any speed. The track was scientifically designed so that cars might be driven around any turn at "design speeds" up to 100

mph. without necessity of touching the steering wheel.

Obviously, the construction of such a track involved extreme care and precision in the resurfacing operation and in the construction of elevated turns and straightways. In addition, however, the continuous and effective sealing of the joints in this instance assumed highest importance from the viewpoint of road maintenance and stability and of safety as well.

Traditional joint sealing methods, it was determined, with their inherent possibilities of separation of joints from the concrete slabs and eventual "toggling" or cracking of the concrete, might nullify the considerable expenditure for the concrete resurface, and in addition prove a source of serious hazard.

Continuous Sealing with Rubberized Asphalt

A positive seal at expansion, contraction and dummy joints in concrete

★ Close-up of compound being poured out of insulated pot on Porath job

paving construction is required if the joint is to be protected against infiltration of moisture and foreign matter during expansion and contraction in the concrete. With top seals of ordinary asphalt, tar or pitch materials, the bond is broken when contraction occurs, resulting in need for maintenance. However, maintenance reseals the joint only until further movement occurs, and does not offset damage to the concrete from moisture and foreign matter while the joint is broken.

At the Packard track a rubberized asphalt joint sealing compound was employed in an effort to provide for continuous effective sealing and water-proofing of all joints. This material conforms to federal specification SS-F-336. The seal material was applied with the help of recently designed equipment specially engineered to solve problems involved in heating and melting the compounds.

The compounds are described by the manufacturer as: "A rubbery, resilient and adhesive plastic, which when heated and poured into expansion and contraction joints of concrete pavement and structures, forms an effective



★ Filling cracks with rubberized asphalt (using Aeroil #120 DVP Kettle)



★ Cleaning cracks with knife and compressed air blower before pouring joints

tive and continuous seal against infiltration of water through the joints during all cycles of expansion and contraction." Experience shows that they will adhere to steel, metal, wood,

tile, etc., as well as to concrete. Being cohesive, as well as adhesive, the compound is self-healing.

Following is procedure followed by the contractor, Julius Porath and Son



Company, of Detroit.

Since the hot-poured compound must form definite contact with the concrete edges, all foreign matter in the joints first had to be removed. Joints were opened up with a power driven hand-held thin-disc emery wheel. The joints were then blown clean using a compressor and long rubber hose with blow pipe. The joints were then ready for pouring.

Special Equipment Requirements

The sealer used here begins to soften at temperatures in excess of 160° F. and is applied at about 400° F. Because of the high percentage of rubber composition, localized hot spots in excess of 500° F. would completely destroy the usefulness of the material.

Accordingly, the normal type of asphalt kettle which puts a heat of well over 1000° F. into pitch or asphalt would require careful handling for work of this type. Use was made of a new type of kettle, built on the double boiler principle with an inner vat (containing the compound to be melted), surrounded by a hot oil bath which is heated by a patented immersion tube system. Two liquefied petroleum gas burners, under accurate temperature controls, were utilized to heat the oil bath.

This double boiler principle of indirect heating provided for the application of uniform controlled heat to all four sides and bottom of the inner vat. Oil bearing tubes running through the length and width of the inner vat applied uniform heat from within the melting compound itself. Fully automatic controls have subsequently been added to this equipment, of special importance in connection with melting.

Melting the Compound

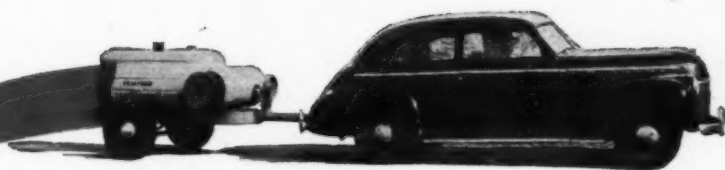
The first step in preparing the compound for melting, consisted of tearing the paper bag wrappings from the material. This was done by first dissolving the clay-paper coverings by swabbing the packages with gasoline soaked rags.

After all outer wrappings were thoroughly removed, the compound was cut into small chunks by means of a detached scraper blade pushed by hand through the material. These small chunks were then fed into the inner vat of the kettle.

Operation Data

Filling the joints was begun on Oct. 23, 1946. The work was completed on Nov. 20 with the kettle kept heated

★ Grinding off rough spots on concrete with special grinding machines



PEAK AIR POWER ON THE JOB

THE NEW
SULLIVAN
SERIES 80
PORTABLE
AIR
COMPRESSORS
ALWAYS DEPENDABLE



- ★ 2 STAGE COMPRESSION
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"The World's Most Modern Portable Compressed Air Plant"

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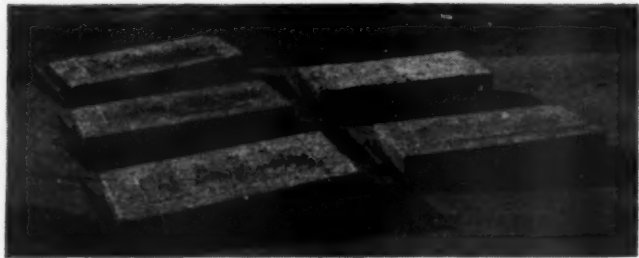
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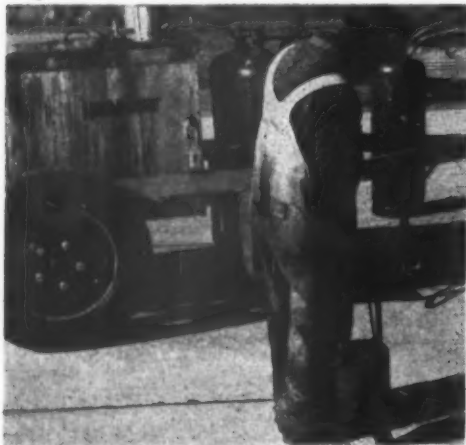
★ Straight-edge testing, to locate and paint-mark high spots needing grinding down



★ The track was thoroughly broomed on completion of work



★ Special step in finishing for high-speed traffic—concrete blocks hitched in clusters were dragged around the track to rub off small particles of mortar and exposed aggregate. New blocks, at left; blocks worn by dragging, at right



★ "Careful! Not too much but just the right amount" was the rule in sealing. (Right): Drawing pot refill

continuously for the entire period, even though several rainy periods were encountered during which no joints were filled. Some 84,000 lin. ft. of joints were filled. During the actual working time, a crew of from 4 to 12 men was used to clean the joints ahead of the pouring and to pour the joints, utilizing insulated conical pouring pots, adapted by the Porath and Packard men.

The actual working time was about 152 hrs. and the average production was about 550 ft. per hr. The biggest day's pour was 11,000 ft. in ten hours. One "double-vat" unit served the entire job.

Propane gas was used to heat the oil surrounding the compound. During the entire 30 days 1780 lb. of propane was consumed, an average of 2.3 lb. per hr. for both burners. The special kettle developed for this work had a special rack to hold two 100-lb.

bottles of liquefied petroleum gas, so that the pneumatic-tired equipment could be wheeled along the roadway as the job progressed.

The accompanying photographs show various steps in the preparation of the joints, filling the kettle, and pouring the cracks. Shown also is the grinding equipment used to level off high spots on the track. Note that the extreme banking at the turns in the track made it necessary to use cables to hold the equipment in place.

Joint sealing at Packard Proving Grounds was carried out by Julius Porath and Son Company of Detroit, under the supervision of Carl Krueger, vice-president and general manager, and S. Albion, engineer superintendent. Supervision for Packard was headed by R. A. Stougaard, manager, buildings and real estate department, and S. J. Dalzell, supervising field engineer.

The anti-diversion constitutional amendment in Tennessee has passed the Senate by a vote of 30 to 1. If the amendment gains a second passage by both Houses it will be submitted to vote by the people. An anti-diversion amendment has also been introduced for a second time in Indiana. In both these States these amendments were passed by 1945 Legislatures. A constitutional amendment to create a separate highway fund has been introduced in Delaware. In that State, revenue from all sources is placed in one fund at the present time.

Parking Manual

A "Parking Manual" comprising 174 pages of useful data for engineers, officials, and civic groups has been published by the American Automobile Association, Traffic and Engineering Department, Washington, D. C. Chapters are included on the general problem of urban parking, causes and effects of parking difficulties, factual studies necessary, how to improve curb parking conditions, off-street facilities, educating the public, and community activities affecting parking. Designed to aid in action programs, the manual is available to non-members of the Association for \$1.00. Address local AAA affiliate or the Association at Washington, D. C.

**KEEP THOSE
CONCRETE
EXPANSION
JOINTS
SEALED**

ALL YEAR 'ROUND!

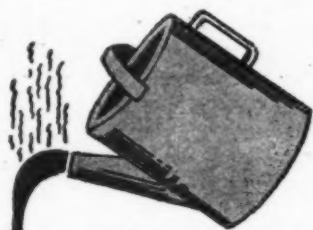
SPECIFY

THE ORIGINAL
Para-Plastic
REG. U. S. PAT. OFF.

HOT-POURED RUBBER SEAL



PARA-PLASTIC conforms fully to Federal Specifications SS-F-336.

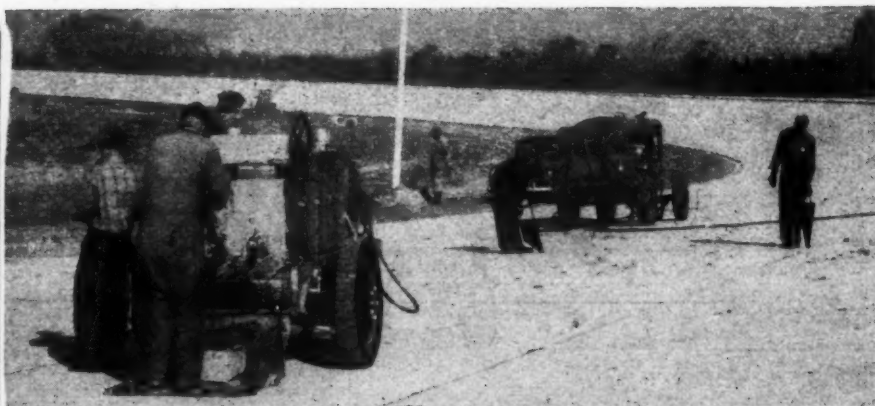


PARA-PLASTIC is the ORIGINAL hot-poured rubber seal for concrete expansion joints.

PARA-PLASTIC remains flexible all year 'round. Its elasticity is permanent in any temperature without breaking its bond with concrete.

PARA-PLASTIC is the positive and permanent top seal for concrete expansion joints all year 'round against the infiltration of water.

**"STICK" WITH THE
ORIGINAL
ALL YEAR 'ROUND**



Para-Plastic

Rubberized Joint Sealer Used in Construction of Packard Test Track

Because absolute perfection in sealing expansion joints was of highest importance, PARA-PLASTIC, a hot poured rubberized asphalt material, was selected to complete this extremely technical job of precise engineering at the Packard Proving Grounds. The construction of this track was one of the most involved and difficult resurfacing operations of the past year.

Contractor, Julius Porath & Son Company, of Detroit, was supplied with the PARA-PLASTIC sealing compound by Mr. Rex I. Lee, of Highland Park, Michigan, representative of Serviced Products.

PARA-PLASTIC is a positive and permanent joint sealer under all temperatures and weather conditions. PARA-PLASTIC is poured as a top seal with the non-extruding premolded expansion joint filler. This rubberized sealer remains resilient, adhesive and effective at temperatures ranging to 40° below zero, and maintains perfect bond. Millions of pounds of PARA-PLASTIC have been used in general construction. The melting of PARA-PLASTIC in heat controlled oil bath kettles is recommended (as illustrated in above photo) but not mandatory.

PARA-PLASTIC is widely specified for Airports, Highways, Dams, Tunnels, Reservoirs, Buildings, Swimming Pools, Spillways, and Underground Electric Terminals.

**Protect the subgrade against infiltration of water
and you prevent miles of pavement failure—
Specify PARA-PLASTIC**

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PARA-PLASTIC is one of the many quality-materials designed and manufactured by Serviced Products Corporation, who have originated and developed outstanding construction materials for over 26 years.



SERVICED PRODUCTS CORP.
6051 West 65th Street, Chicago 38, Ill.

(Continued from page 90)

Tennessee

Expenditures in 1946 for contract construction were \$11,600,000. Work to cost \$7,125,000 was carried over to 1947. Expected expenditures for 1947 total \$24,000,000.

Alabama

State highway construction costing \$7,235,000 was completed in 1946. The work included 235.6 miles of graded and drained roads, 267.9 miles of bituminous surface treated highway and 26.8 miles of portland cement concrete. In addition bridges having a total length of 0.871 miles were completed.

The uncompleted contracts carried over to 1947, for the completion of which an estimated expenditure of \$13,000,000 is required, were as follows:

	Miles
Graded and drained.....	402.0
Bit. surf. treat.....	452.0
P. C. concrete.....	32.8
Bridges.....	0.64

The construction program for 1947 had not been decided at the time this report was made.

Mississippi

State highway projects completed in 1946 comprised 14.4 miles of graded and drained road at a cost of \$557,833; 10.4 miles of sand asphalt costing \$174,960; 6 bridges, \$141,644; crossing protection \$3,440, and grade crossing separation, \$23,732. This 1946 work involves projects carried over from 1945 and does not involve post-war highway financing.

Uncompleted contracts estimated to cost \$10,918,348, were carried over to 1947. The type and mileage of these projects are as follow:

	Miles
Bit. surf.....	84.145
Bit. pav.....	21.956
P. C. concrete.....	40.550
Graded and drained.....	214.817
Bridges.....	0.793

The tentative construction program for 1947 calls for the following: Graded and drained and bridges, \$12,000,000; hard surfacing all types, \$2,600,000, 9 grade crossing separations \$710,000.

West South Central States

Arkansas

Contract awards by state highway commission during 1946 totalled \$8,502,964. This work involved the following approximate mileage by type:

	Miles
Grading.....	44.13
Crush. stone and grav. base course.....	111.33
Bit. surf.....	119.19
Gravel surf.....	3.34
Bridges.....	2,202 lin. ft.

County Roads off State Highway System

	Miles
Bit. surf.....	1.32
Gravel surf.....	8.88
Bridges.....	53.67 ft.

The construction program for 1947 had not been completed on Dec. 31.

Louisiana

State highway construction costing \$2,893,000 was completed in 1946. Unfinished contracts amounting to \$4,334,000 were carried over to 1947. Probable construction program for 1947 will cost \$15,000,000.

Alabama

Contracts totaling \$21,003,124 were awarded in 1946 by state highway department. The work put under construction included 95.5 miles of hard surface pavement; 328.3 miles of bituminous surfaces; 223.9 miles of grading and drainage, and 121 miles of bridges.

The program for 1947 covering new construction and major reconstruction calls for an estimated expenditure of \$19,872,000.

Texas

A total of \$30,942,171 was expended for state highway construction in 1946. Uncompleted construction contracts involving an expenditure of \$60,641,600 were carried over to 1947. Of this amount \$39,629,853 is unearned and unpaid. Probable 1947 construction expenditures are \$50,000,000.

Mountain States

Montana

State highway work costing \$2,566,944 was completed in 1946. The projects included 18.7 miles of gravel surface at a cost of \$289,196; 78.4 miles of oiled roads, costing \$1,483,022; and bridges at a cost of \$794,026.

Uncompleted contracts estimated to cost over \$7,000,000 were carried over to 1947. The type, mileage and estimated cost of these projects are given below:

Uncompleted Contracts Carried Over to 1947

	Miles	Est. Cost
Graded and drained.....	312	\$1,241,088
Gravel surf.....	87	1,297,686
Oiled.....	141	4,107,300
Bridges.....	.....	367,126

The construction program for 1947 had not been completed at the time of this report.

Wyoming

Construction contracts amounting to \$7,500,000 were let in 1946 by the state highway department and 450 miles of highway were placed under

contract. In addition contracts were let for 65 miles of reconstruction and betterment work on the primary system. The cost of this was about \$600,000 which came from state funds. It is planned to continue this program of state betterment work in 1947 and the mileage to be constructed will be about the same as in 1946.

The 1947 construction program calls for an estimated expenditure of \$8,000,000. The program will include many construction projects located in all sections of the state. It is planned to build between 400 and 500 miles of highway consisting of all types of work involving grading, draining, surfacing, bridges and bituminous pavements. The Federal Aid secondary program will account for approximately 150 miles of this work. The remaining mileage will involve work on the primary Federal Aid system, much of which will be re-constructed on new alignment and grade.

Colorado

Over 180 miles of state highway were completed or contracted in 1946. The principal item was 132 miles of gravel surface estimated to cost \$4,246,248. The 1947 construction program calls for the construction of 290 miles of gravel surface at an estimated cost of \$12,904,187. Included also in this year's program is the driving of 1.87 miles of tunnels, estimated to cost \$1,437,000. The following tabulation gives some details of the work:

State Highway Mileage Completed or Contracted in 1946

	Miles	Est. Cost
Graded and drained....	19.8	\$1,216,176
Gravel surf.....	131.8	4,246,248
Bit. surf. treat.....	28.7	177,512
P. C. concrete.....	0.1	22,345
Bridges, 27.....	.....	614,636
Grade cross. sep., 13....	.....	69,350

Proposed State Highway Construction for 1947

	Miles	Est. Cost
Gravel surf.....	289.8	\$12,904,187
Bit. surf. treat.....	189.4	3,723,703
Bit. concrete.....	1.0	150,000
Bridges, 100.....	.....	2,715,655
Grade cross. sep., 10....	.....	1,350,000
Grade cross. prot., 29....	.....	108,027
Tunnels.....	1.870	1,437,027

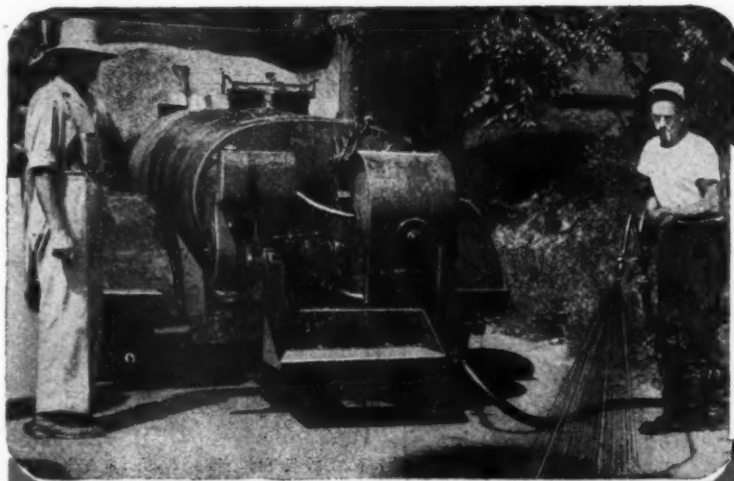
New Mexico

A considerable mileage of state highway construction was completed in 1946. This work included 339 miles of mixed bituminous at a cost of \$5,489,150; 47.6 miles gravel surface costing \$825,987; 201 miles of bituminous surface treatment, \$509,547; and 2.2 miles graded and drained road at \$14,251. In addition bridges, costing \$55,430, were completed.

The uncompleted contracts carried
(Continued on page 118)

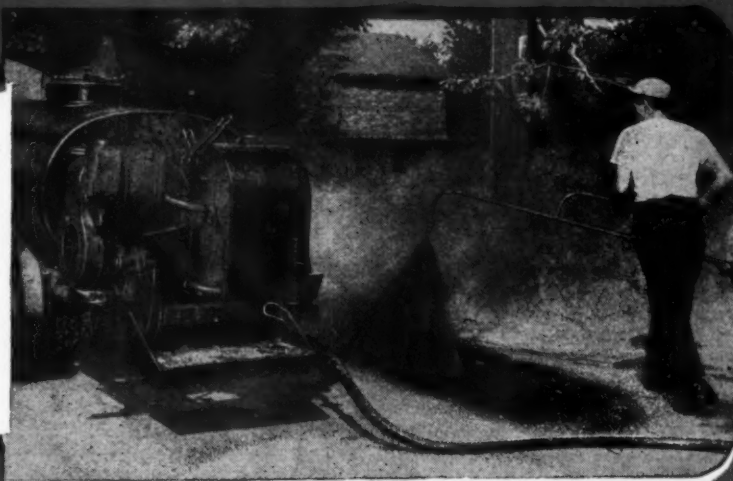
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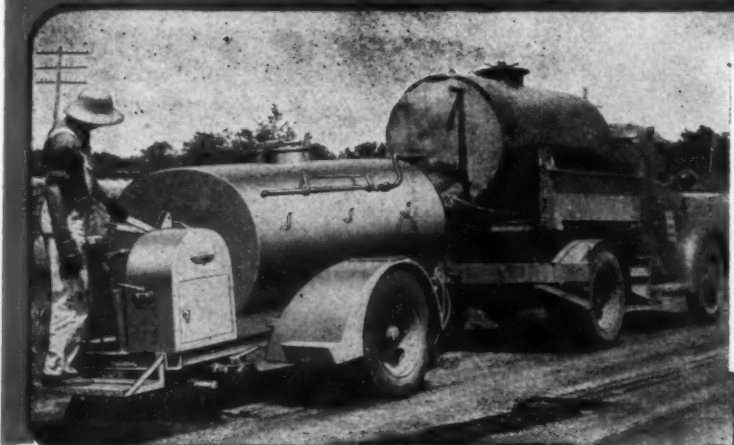


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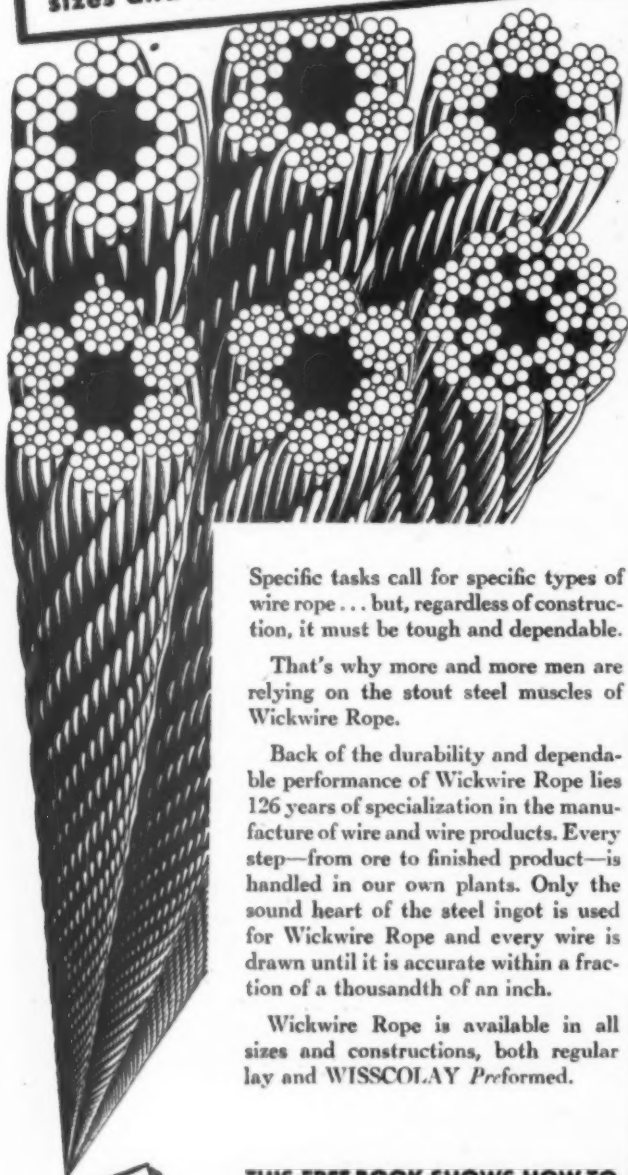
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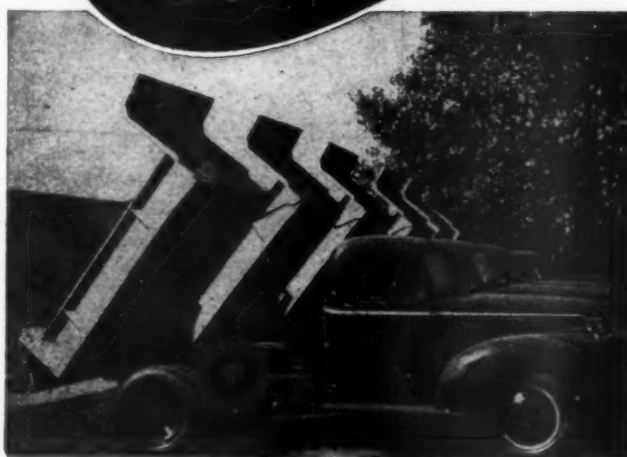
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Splicing to Save Rope

From the publication, "How to Keep Your Wire Rope Working," by American Chain and Cable Company

WHEN concentrated wear develops in one location—the rest of the line being in serviceable condition—it may well be worthwhile to splice in a section of new rope.

In many cases a length of rope less than 15% of the length of the whole line has kept the old rope on the job.

However, results are due, very largely, to the expertness with which splicing is done. It is not a job for inexperienced hands. Operators who decide to do this maintenance job themselves are advised to get the best available men for the job and have them make many practice splices with old rope. Better still, get an experienced wire rope splicer.

A poorly made splice may not develop as much as 50% of the strength of the rope, which means that if the rope were supposed to operate with a Factor of Safety of 6, the Safety Factor of the poorly spliced line would be no more than 3—a dangerous condition.

Long or Endless Splice

First examine the rope carefully and mark the full extent of the section to be replaced. Using a wire rope gauge, check rope diameter in both directions from the damaged section for two reasons:

(a) To reach a point where the diameter of the old rope is as close as possible to the diameter of the new piece, and

(b) To have the "bulge" due to splicing located a safe distance from the damaged section. If permitted close to the old worn spot, the original cause of the damage—if not corrected—might cause severe wear on the area

of the tucked-in ends of the rope.

It is important, before splicing, to make every effort to correct the cause of acute wear, or minimize it. Certainly, also, correct any fault of alignment, grooves, or bearings of parts carrying the rope.

Length of Splice

Based on this field experience, the length of splice should approximate 40 times in feet the diameter of the rope in inches. As an example: Given a $\frac{3}{4}$ in. diameter rope, the length of splice should approximate 30 ft. Men in the field should use the method described in the following and place the two ends to be spliced so that they

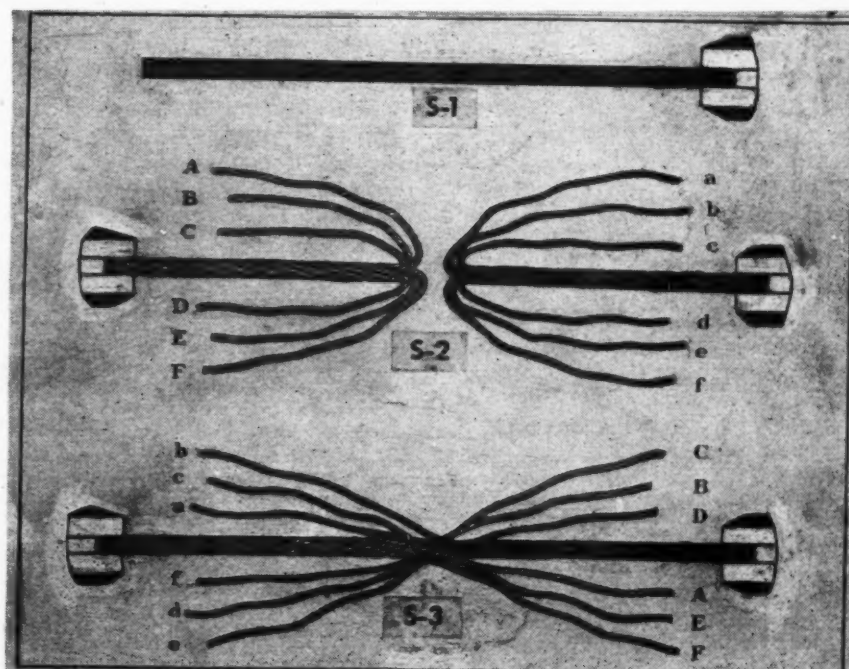
overlap approximately 35 ft. Securely fasten each rope about 35 ft. from the end, using such means as will keep the rope from moving in any direction.

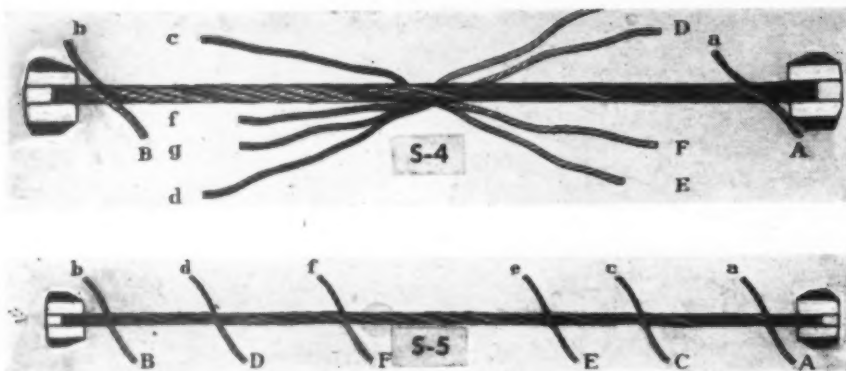
About 5 ft. from the point of fastening, seize each end of the rope just as for cutting it. This will leave about 30 ft. free for splicing two ends. See Fig. S-1.

Unlay each rope or end for a distance of 15 ft. Cut off the cores and bend the strands back so that they will not impede the next operation. See Fig. S-2.

Interlock the Strands

Next butt the ropes close together





and interlock the strands, being certain that the strands of one rope or wire rope end are separated from each other by the strands of the other rope or end. Do not overlook this point as it is essential. See Fig. S-3. And be sure that this operation is handled in such a way that strand "a" will be alongside of strand "A." Note, in passing, that the strands are identified as "a" and "A," etc., to mark them as neighboring strands of the opposing ends or ropes.

Next unlay sufficient of the strand marked "a" remaining in the rope so that the strand marked "A" can be laid in the same groove. Then lay in strand "A" until all but 24 in. of it are in the groove that was formerly occupied by "a."

The next step is to unlay strand "B," so that strand "b" can be laid in the groove formerly occupied by "B" and so unlay "B" and lay in "b" until 24 in. of "b" remain projecting.

Note the change here. First the rope "a" at the right side was unlay

After this last operation, all the strands will be tucked into their proper grooves. However, there will be ends of the strands of varying lengths projecting from the body of the rope. These should be cut until they are equal to 32 times the rope diameter. As the example used is a proper splice for a $\frac{3}{4}$ -in. rope, all loose ends of the strands should be cut to 2 ft. in length—the original length left projecting of "A" and "b."

Tucking-in the Ends

The splice will then look like Fig. S-5. The remaining step is to tuck in the ends so that the diameter of the rope will not be increased. Before tucking, tape the strand ends.

Tucking is done by removing the hemp center and putting the ends of the strands in the place that it formerly occupied. To do this, first untwist the strands at the point where you find strands "Aa" so that the hemp center can be pulled out with a pair of pliers.

Rope Diameter	Extra Length Allowance	Rope Diameter	Extra Length Allowance
$\frac{1}{4}$ " - $\frac{3}{8}$ "	1'	$\frac{1}{4}$ "	3'6"
$\frac{1}{2}$ " - $\frac{5}{8}$ "	1'6"	$\frac{1}{2}$ "	4'
$\frac{3}{4}$ " - $\frac{7}{8}$ "	2'	$\frac{3}{4}$ "	4'6"
$\frac{1}{2}$ " - 1"	2'6"	$\frac{1}{2}$ "	5'
1 $\frac{1}{8}$ "	3'	2"	5'6"

to accommodate "A" which was on the left. This was followed by unlaying "B" which is on the left so that it would accommodate "b" which was on the right. This method of alternating the end from which the splicer works is also a necessary item of correct procedure.

The appearance of the splice then will be as in Fig. S-4.

Proceed alternately, then, as before—unlaying "c" and laying in "C," but stopping just 6 ft. short of the point where "A" projects from the rope.

Follow this by unlaying "D" and laying in "d," stopping 6 ft. short of where "b" projects from the body of the rope.

Then unlay "e" and lay in "E," stopping 6 ft. short of "C," and finally unlay "F" and lay in "f," stopping 6 ft. short of "d."

★ Figure T3-1

ends and push the end of the hemp back into place. Draw out the other end of the hemp core in the opposite direction and lay the other strand in the center of the rope as described previously. Then remove the twister.

Repeat the same operation at the five remaining points and, finally, tap the entire length of the splice and the splice is completed.

Use wooden mallets for tapping—one held on the opposite side of the rope to the spot which is tapped.

Tapping is done to give the rope a uniform diameter.

Splicing Preformed Wire Rope

The general procedure for making a splice is the same whether the rope is non-preformed or preformed. However, when all of the strands have been properly unlayed and laid in, as shown in Fig. S-5, the projecting ends of the preformed strands should be straightened out and wrapped with friction tape so that the wrapped ends are increased in diameter to about 40% of the diameter of the whole rope.

Taping of the strand ends of the splice is essential. It is good practice, also, to tape the strand ends of a spliced non-preformed wire rope.

After the ends are taped, tuck the strands so that they lay parallel instead of crossing at the point of tuck. Flatten the two strands where they pass each other, to reduce the bulge at this point.

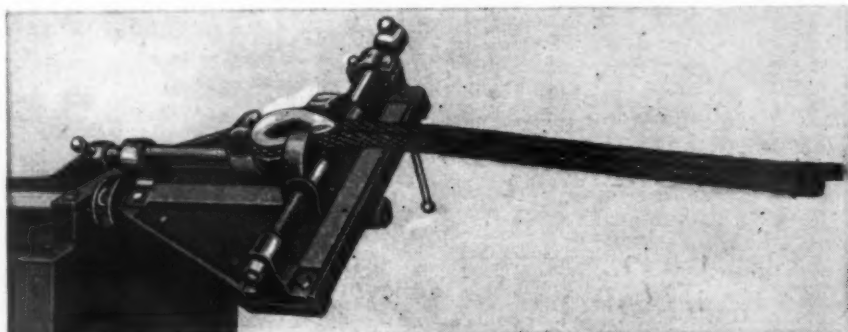
It is also essential when splicing preformed wire rope that the tucked ends do not butt, one against the other. In fact, core between tucked ends is also desirable in a non-preformed splice—though not, as with preformed rope, essential.

Different procedure is required to splice ropes with a different number of strands and also to splice 19-wire strand.

Short Cut Splicing

Experienced splicers use what they consider a short cut but they follow the same principles.

In the "short cut" method, the two ends to be spliced are laid side by side, as described. Then "a" is unlay all the way back to the wire seizings.



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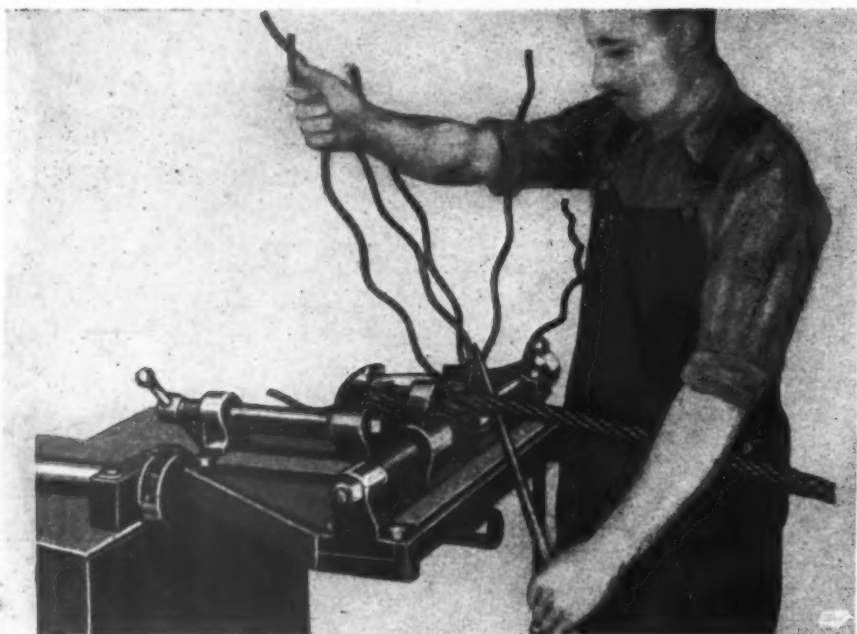
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★ Figure TS-2

★ Figure TS-3

Then strand "A" is unlaid from its end and laid into the groove formerly occupied by strand "a."

Using the same principle of alternating, the operation follows the system originally described.

Thimble Splice

A rigger's vise, as illustrated, should be used. In addition there are needed a marlin spike, pliers, a length of pipe, two wooden mallets, serving wire, rope, knife and pair of cutters.

The extra rope to be allowed for splicing a thimble of proper size into a rope varies with the rope diameter according to table.

As can be seen, if a thimble were to be spliced into a $\frac{3}{4}$ -in. rope and the finished length was desired to be 50 ft., 52 ft. of rope would be used.

Approximately, then, 2 ft. from the end of the rope, put a bend into the rope, lay a thimble of the correct size into the bend and clamp it securely in the rigger's vise, as shown in Fig. TS-1. Expert splicers develop their own technique. This includes a preference for standing with the work either to their right or to their left or for having either the 2-ft. end or the long end of the rope closer to them.

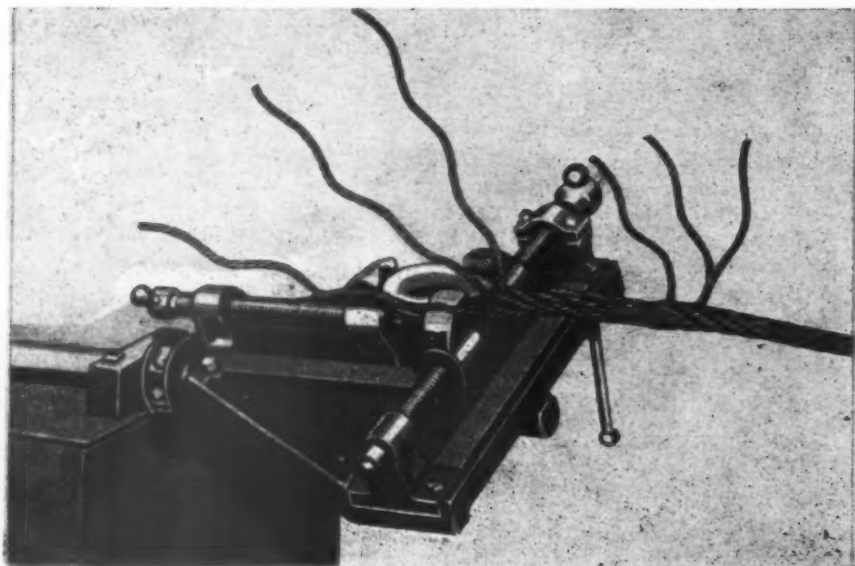
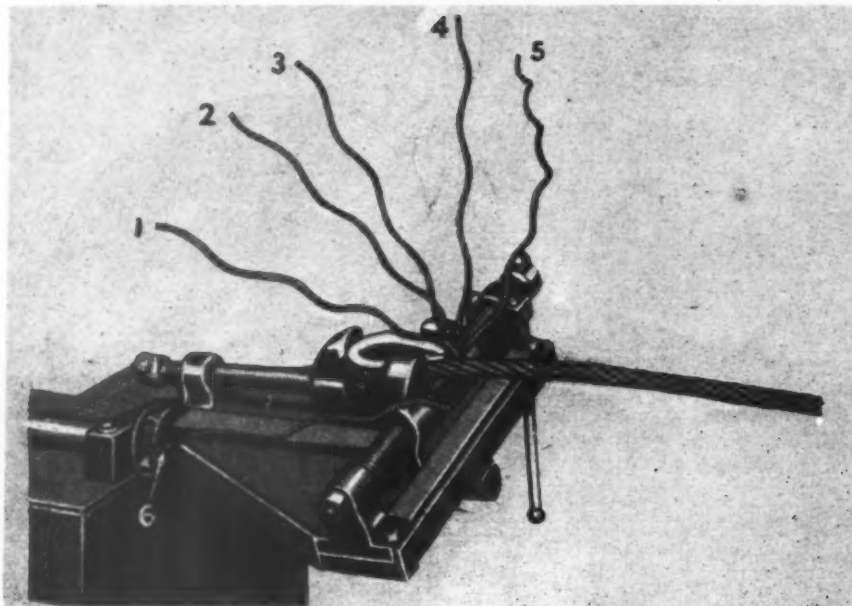
If the rope be non-preformed, the seizing is removed from the free end of the rope so that the strands will untwist. Unlay the two feet back to the thimble and apply a serving of fine annealed wire to each strand to prevent raveling during splicing. If splicing preformed wire rope, straighten loose strands.

Cut off the hemp center close to the thimble. If the rope uses a wire strand or independent wire rope center this should be cut off short of the thimble—not as close as a hemp center.

Bend two strands to the left and four to the right, placing them in position for making the 4 tuck splice which is used in this operation.

To facilitate the remaining operations, some operators slightly untwist or loosen the lay of the rope close to the thimble. To do this, wrap a double piece of hemp rope five or six times around the rope about 2 ft. from the point of the thimble—wrapping it in the same direction as the lay of the rope and spirally toward the thimble. Insert a piece of pipe in the loop and rotate in the same direction as the rope lay for sufficient distance to loosen the lay.

★ Figure TS-4



Next, insert a marlin spike under the two strands closer to the point of the thimble. See Fig. TS-2. Rotate the marlin spike a half turn in the direction of the splicer. Insert strand No. 1 (Fig. TS-3) through this opening. By rotating the spike to the point of the thimble, one tuck is given to strand No. 1.

Next, tuck strand No. 2, see Fig. TS-3. The same procedure is used as in tucking strand No. 1. The end is tucked through the next single strand in the long end of the rope.

Note the Order of Procedure

Strand No. 6 is the next strand. It is tucked under the two strands which will be the fifth and sixth strands from the point of the thimble on the long end of the rope.

Strand No. 5 is next inserted in an upward direction through an opening made by inserting the marlin spike under the next single strand—the fifth from the point of the thimble. Rotate the spike a half turn, each time pulling the strand up through the opening until the last or fourth tuck which is made by inserting the strand down through the opening.

Repeat with strands Nos. 4 and 3, taking the next laid strands as they come in order on the long end of the rope. See Fig. TS-4.

Complete strands Nos. 2, 1 and 6 in the order shown by giving each of them three more tucks.

Cut off the long ends which project. Hammer out all the inequalities, using a wooden mallet.

Apply seizing wire. To do this, lay the free end of the wire close to the point of the thimble, taken back sufficiently past the beginning of the splice to cover strands which may have been unlaid in this operation. Begin seizing at that point. Draw the seizing wire around the splice with uniform tension, each wire close to the next, until the wire just covers the point of the thimble.

Cut the wire at this point and hold it firmly in place by twisting it with the free end of the serving wire which has been left there for that purpose. Cut the twisted wires and tap them with a mallet so that they will lie close to the rope.

Approximate Strength of Thimble Splices

Diameter, Rope	Efficiency
1/4" and smaller	100
3/8" to 1/2"	95
5/8" and 1"	88
1 1/8" to 1 1/2"	82
1 3/8" to 2"	75
2 1/4" and larger	70

It is advisable to splice a thimble in an eye attachment. Lacking such reinforcement, ropes kink in the top

of the eye, and/or flatten out of shape elsewhere. Strands become displaced. Efficiency is impaired dangerously.

First Controlled Access Highways

The four streets which cross Central Park in New York City from 5th Ave. to 8th Ave. were probably the first examples in the United States of roads with controlled access. They were constructed in the 1880's or 1890's for the use of horse-drawn traffic crossing Manhattan Island from one water front to the other without impairing the park environ-

ment. They are still in existence. They are depressed and have stone retaining walls on both sides. They are crossed with stone bridges for the accommodation of carriage roads through the park. In addition to being the first controlled access highways, they also are probably the first examples of highway-grade separations.

1946 Gas Consumption Tops 1941 Record—Motor vehicles consumed approximately 25,200,000,000 gal. of gasoline during 1946, an increase of about 4% above the previous high record of 24,200,000,000 gal. in 1941.



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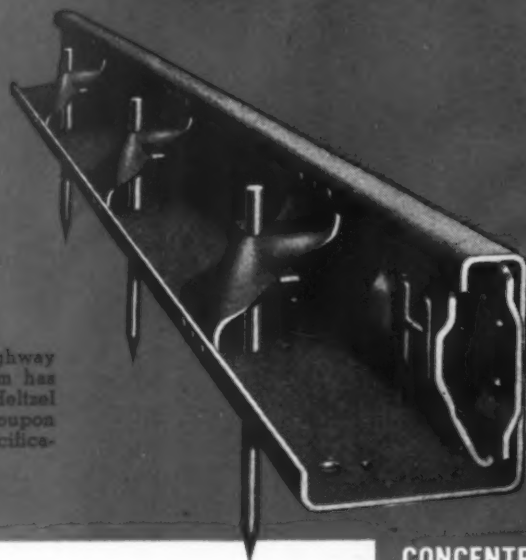
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Forest Products Research Society Organized

The Forest Products Research Society—designed to meet the need for a national association devoted entirely to stimulating wood research, development, utilization and production—has been organized, effective Feb. 1, following a meeting held at Madison, Wis., of industrial, educational and government forest products technologists. Membership in the society is open to men who are engaged or interested in any phase of forest products activity.

National officers elected to head the new society in its first year include Fred W. Gottschalk, Chicago, Ill. (Technical Director, American Lumber and Treating Co.), president; George A. Garratt, New Haven, Conn. (Dean, School of Forestry, Yale University), vice-president; William J. Baker, P. O. Box 2088, University Station, Madison, Wis. (Technologist, U. S. Forest Products Laboratory), secretary-treasurer; and Bror L. Gronal, Seattle, Wash. (Professor of Forestry, University of Washington), past organizational chairman.

Hook Succeeds Donaldson at CAA

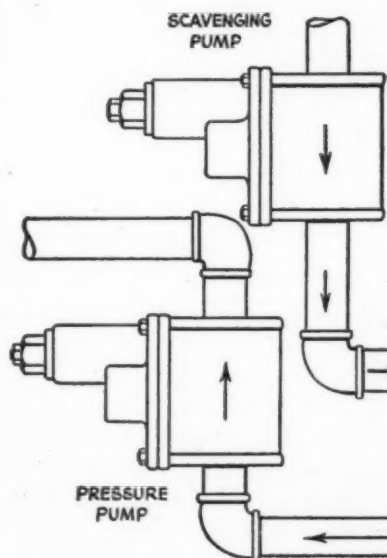
Washington, D. C.—H. Arthur Hook, a veteran of almost 20 years with the Civil Aeronautics Administration and its predecessor organizations, has been appointed Assistant Administrator for Airports to succeed Charles B. Donaldson, announces T. P. Wright, Administrator of Civil Aeronautics. Mr. Donaldson has transferred at his own request to the Sixth Region, where he will serve as Airport Engineer for the State of Nevada. He served in the position of Assistant Administrator for Airports from 1941.

Governors of two more States have recommended increased highway revenues. In California the Governor has requested doubling the present gas tax and tripling the diesel fuel tax to meet the proposed gigantic highway expansion program. In Arkansas the Governor has asked for generally increased highway revenues.

Federal Automotive Taxes—Automotive and excise taxes collected in December from highway users by the Federal Government amounted to \$151,207,337 as compared to \$85,752,914 in December, 1945. Gasoline tax totalled \$40,126,638.

Diesel Engine **DANGER** points

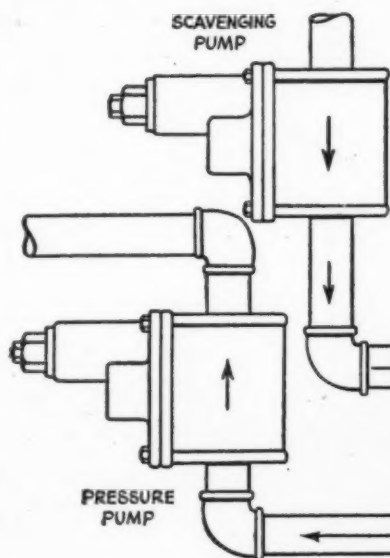
AIR BUBBLES ENDANGER OIL CIRCULATION



In Diesel engines equipped with dry-sump lubricating systems, air and oil are sucked into the scavenging pump and whipped into foam. These air bubbles may enter the pressure pump and interrupt cir-

culatation of oil, retard full flow of lubricant to bearings and other vital points. Crankcase foaming in wet-sump engines can frequently be a problem, too, and should, of course, be controlled.

RPM DELO OIL PREVENTS CRANKCASE FOAMING

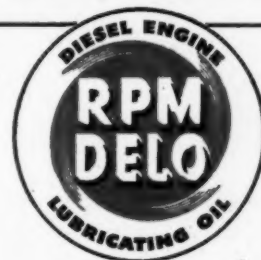


To break up the formation of air bubbles and control the effect of aeration by increasing the surface tension, a "de-foamer" in RPM DELO Diesel Engine Lubricating Oil eliminates this hazard in Diesel engine operation. No matter how

much air is drawn into the oil, RPM DELO Oil is free from foam. Other compounds in RPM DELO Oil are similarly effective in preventing stuck rings and engine deposits, eliminating bearing corrosion, reducing wear.

To match the fine performance of RPM DELO OIL, use these equally efficient companion products from the same famous "RPM" line—RPM HEAVY DUTY MOTOR OIL—RPM COMPOUNDED MOTOR OIL—RPM GEAR OILS AND LUBRICANTS—RPM GREASES. For additional information or name of your distributor, write any of the companies below:

STANDARD OF CALIFORNIA • 225 Bush St., San Francisco 20, California
 THE CALIFORNIA COMPANY • 17th and Stout Streets, Denver 1, Colorado
 STANDARD OIL COMPANY OF TEXAS • El Paso, Texas
 THE CALIFORNIA OIL COMPANY • 30 Rockefeller Plaza, New York 20



New Construction Equipment and Materials

1.

New Diesel Power Units

Production has been started by International Harvester Co., Chicago, Ill., on a 125 HP Model UD 18A power unit and on a 76 HP UD-14A power unit. Both power units are heavy-duty 4-cycle Diesels with the same bore and stroke. The UD-18A has six $4\frac{3}{4}$ x $6\frac{1}{2}$ in. cylinders, and the UD-14A has four. The UD-18A and UD-14A deliver in full measure considerably more power without increase in weight over the popular UD-18 and UD-14 models which they displace. A new



International UD-18A Diesel Power Unit

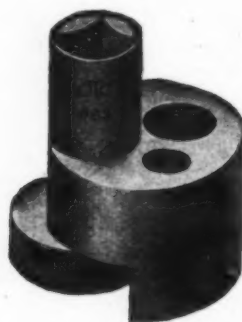
cylinder head arrangement, improved nozzles, and redesigned precombustion chambers give them higher compression and greater efficiency in converting fuel energy into low-cost power. Since the International Diesel starting system does not require preheating of the incoming air even in cold weather, it has been practical to locate the exhaust manifold on the injection side of the engine, away from the intake manifold. As a result, incoming air is kept cooler. Volumetric efficiency or "breathing" ability, is greatly increased resulting in more lugging ability and greater power output with clean combustion. Both the UD-14A and UD-18A power units achieve their higher r.p.m. and increased horsepower without resort

to special lubricating oils. Ordinary lubricating oil of good quality is satisfactory for these engines because of excellent cooling and combustion characteristics. An oil control ring of a new type assures satisfactory cylinder lubrication without excessive oil consumption.

2.

Improved Stud Puller

A new stud puller, stated to have a wider range of capacity than most similar tools on the market, has been added to the line of the Owatonna Tool Co., 319 Cedar St., Owatonna, Minn. The puller will take studs from $\frac{1}{4}$ to $\frac{3}{4}$ in. in diameter and can be used with any $\frac{1}{2}$ in. drive socket handle. The knurled wheel is held in place with a compression ball and



OTC Stud Puller No. 865

spring and is easily removed and replaced, making it easy to install a new wheel when the old one wears out.

Mail Inserted Card

for data on equipment described in these pages. See also inquiry blank on page 127

3.

New Asphalt Mixer

The Foote kinetic mixer, a portable 3 cu. ft. machine employing a radically new mixing principle, has been announced by The Foote Co., Inc., Nunda, N. Y. This mixer is designed to handle all types of cold asphaltic mixes, including sheet asphalt and asphaltic concrete. It is claimed that



Foote Kinetic Mixer

the new mixing principle provides a thorough coating of all aggregate particles with asphalt, making possible the completely successful use of chemical additives to eliminate the need for drying wet aggregates. Capacity of the Foote Kinetic Mixer under good conditions is stated to be as high as two batches per minute. The operating cycle at this speed is 5 seconds for charging from a wheelbarrow, 20 seconds for mixing, and 5 seconds for discharging by a hand-controlled chute at the top of the machine. The mixing action which permits this high output is accomplished by a revolving drum and three stationary blades. Material is held against the inside face of the drum by centrifugal force. An energy converter blade peels a stream of material off the drumface, creating an end-over-end mixing action. Two cross-mixing blades create a side-to-side mixing action. Asphalt is introduced into the drum by a Yale & Towne tri-rotor pump at a maximum rate of 8 gal. in 6 seconds. The

pump is controlled by an automatic timer which closes the hand-operated control valve when the desired gallonage has been introduced. This pump can also be used for unloading tank cars of asphalt. The mixer is powered by a 12 H.P. gasoline engine, or can be equipped with an electric motor. Over-all height is 58 in., length 81 in., width 68 in. Approximate weight is 1500 lb. Pneumatic tires are 6:00 x 16. An adjustable truck hitch is provided for transporting.

4.

Equipment Trailers

Equipment trailers in 15-ton, 20-ton and 25-ton models are now in production by Dorsey Trailers, Elba, Ala. Each model has a width of 8 ft., a platform length of 16 ft. 3 in., a length to rear of drop 19 ft. 9 in., and



Dorsey Equipment Trailer

an overall length of 28 ft. 10 in. Noteworthy features of these trailers are the brake and axle assemblies. The brake is of heavy duty design specifically developed for trailer service. Wide brake shoes and liners provide quick, positive brake application for heaviest loads. Use of the cam-actuating principle with camshaft needle bearing assures constant power for perfectly smooth and uniform control whether trailer is loaded or empty. Brakes can be either vacuum-actuated or air-operated. The tubular axles are of three-piece design, heat treated, with high precision ground spindles inserted. Spindle ends are forged from high stress, high grade steel and subsequently fully heat treated. Axles are mounted to a rugged, flexible, shock absorbing silico-manganese spring assembly by means of heavy U-bolts. Steel spring seats are welded to the axle, and the U-bolts inserted through the seats.

5.

New Small Tournapull

A new small Tournapull developed by R. G. Le Tourneau, Inc., Peoria, Ill., is stated to feature many new developments in design. This Model D is powered by an 85 HP gasoline engine, and is equipped with the new E-4 carryall scraper, having a load limit of 4 tons and a struck capacity of 3.3 yd. The unit is self-loading,

has 4 speeds forward, 4 reverse, and travels up to 23 miles per hour. One of the outstanding features of this Tournapull is the new electric control by individual electric motors which replaces conventional tractor steering and gear shift levers. It also eliminates the need of a power control unit for scraper operation. Operator steers, shifts and handles all scraper controls by buttons on the electric



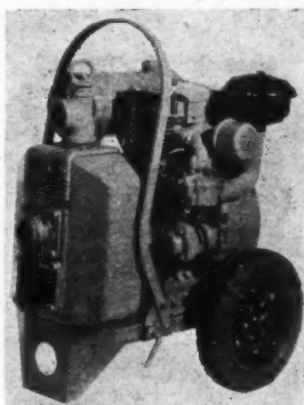
Model D Tournapull

control panel. The Model D has a new type differential which is stated to keep both wheels pulling it at all times. The model is equipped with air brakes. Overall dimensions are: length 22 ft. 5 in.; height 7 ft. 4 in.; wheelbase 13 ft. 2 in.; width of cutting edge 6 ft., and weight, empty, 7½ tons. A new type and size of pneumatic rubber tire is used on the 2-wheel D Tournapull prime mover. This is a 14.00 x 32 tire with tapered beads which seats itself firmly against the wheel rim at low air pressures.

6.

New Centrifugal Pump

A new line of Rex press-formed self priming centrifugal pumps, announced by Chain Belt Co., Milwaukee, Wis., is stated to have many features of construction that are unique in self priming centrifugal pump design. The pump body is press-formed



Rex Press-Formed Pump

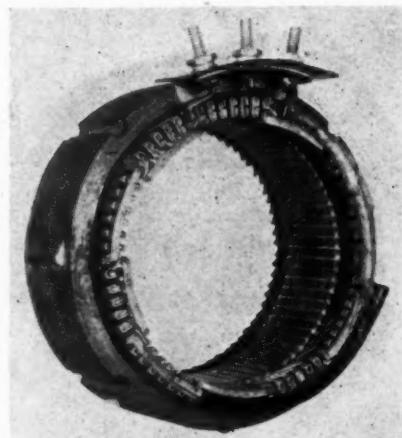
of Armco ingot iron. Another advantage of the new design is the great saving in weight. In the 2 in. size, for example, the new Rex press-formed pump weighs 90 lbs. less than the former cast iron design. Pumping efficiency has been improved, due, in part, to the smooth surface of the

pump and press-formed volute. A faster prime is assured by an improved method of priming.

7.

New A-C Generating System

A new kind of A-C generating system, featuring a revolutionary application of an alternator, has been developed by The Leece-Neville Co., Cleveland, O., for 6- and 12-volt service on all types of mobile equipment requiring extra-high current output



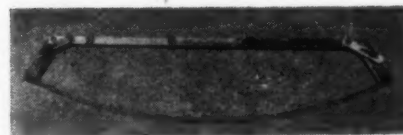
3-Phase System Assembly of Alternator

at low and high speeds to maintain batteries. Chief advantage claimed for the system is its ability to deliver 25 to 35 amperes at engine idle speed and 60 amperes from 12 to 15 miles per hour to top car speed. Based on observation of actual installations and results of laboratory tests, Leece-Neville states that this new generating system can practically eliminate the need for recharging when installed in connection with a battery in A-1 condition. Consisting of alternator, voltage regulator and rectifier, the system weighs 40 lb. The alternator is of simplified design, having no commutator or rotating armature windings. The 12-volt version of this new system weighs 42 lb.

8.

Adjustable Curve Drafting Instrument

An instrument that has come into use in the past 6 months in the drafting rooms of many state highway departments for highway curve platting is illustrated below. The flexible strip



Adjustable Curve Drafting Instrument

*The MODERN WAY to
Better - Faster Paving
and BIGGER PROFITS too!*



**STIFF
HARSH
ECONOMICAL
MIXES LIKE
THIS ARE
QUICKLY
MADE PLASTIC
LIKE
THIS**

**with the JACKSON
VIBRATORY PAVING TUBE**

★ Important savings in cement can be made. ★ Finishing progress is much more rapid. ★ Concrete at forms and joints is puddled perfectly. ★ Spreading costs reduced. ★ Complete compaction and excellent finish obtained with less labor.

The JACKSON Paving Tube is perfectly adaptable to slabs 6" to 24" thick, without affecting the efficiency on single or two-course standard plain or reinforced concrete pavement construction and may be quickly adjusted from 10' to 25' widths in the field. Power Plant mounted on the Finisher has ample reserve power through entire frequency range of 3000 to 5000 VPM. Finger tip controls. Quickly and easily attached to any standard finisher — and can be attached to the rear of standard spreaders to advantage for vibrating the first course in thick slab construction. One of the best investments in equipment a paving contractor can make. See your Jackson distributor or write for further information.

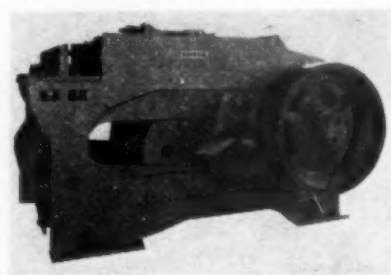
Manufactured by **ELECTRIC TAMPER & EQUIPMENT CO.** for
JACKSON VIBRATORS, INC. LUDINGTON, MICH.

is milled from Lucite plastic with a projecting member for the ruling pen to rest against. The underneath side has a section $1/32$ in. x $1/16$ in. cut away to prevent the ink from running underneath and blotting. The frame is made from tempered aluminum alloy. On instruments calibrated in degree of curvature to the scale of 1 in. = 100 ft. the scale of adjustment is indexed at 15 minute intervals. The range of adjustment for the small instrument 1 ft. 6 in. long, is 0° to 6° , or infinity to 10 in. actual radius. The range of the large instrument, 2 ft. long, is 0° to 4° , or infinity to 1 ft. actual radius. The instrument is made by Albert G. Daniels, Winnsboro, S. C.

9.

Two Stage Crusher

A crusher in which both jaws move has been placed on the market by Ebersol Crusher & Engineering Co., Lancaster, Penn. One jaw moves in a rotating path, the other in a strictly vertical path. The division in the



Two Stage Ebersol Crusher

jaws providing a screen between the upper set of jaws and the lower set also is new and thus, by removing many of the fines which are made during the initial crushing in the upper jaws, a much closer setting can be obtained in the lower jaws. The illustration shows a 9 x 40 crusher which will take a full 9 in. stone. If desired, the discharged opening can be set as close as $\frac{1}{2}$ in. without packing.

10.

New Cable Control

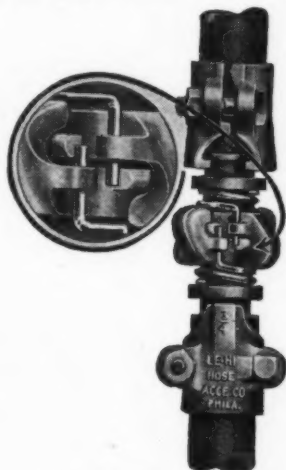
In order to provide a lower cost rear-mounted double drum cable control unit for use with "Caterpillar" Diesel D6 and D7 tractors, Caterpillar Tractor Co., Peoria, Ill., is now producing a new cable control designated as the No. 23. Designed to develop line pulls ample to meet service requirements imposed by the operation of scrapers, bulldozers and rippers, the new cable control provides smooth, easy operation with a minimum of adjustments. The No. 23

offers all the features of the company's No. 25 rear double drum cable control and the No. 24 single drum, front-mounted control, including the smooth performing multiple disk type clutch which has been a performance feature of "Caterpillar" track-type tractors for years.

11.

New Air Hose Coupling

A new universal type hose coupling having a simple, positive, built-in locking device that provides maximum safety for workers, using high-pressure air hose lines, has been placed on the market by the Hose Accessories Co., Philadelphia, Pa. This patented



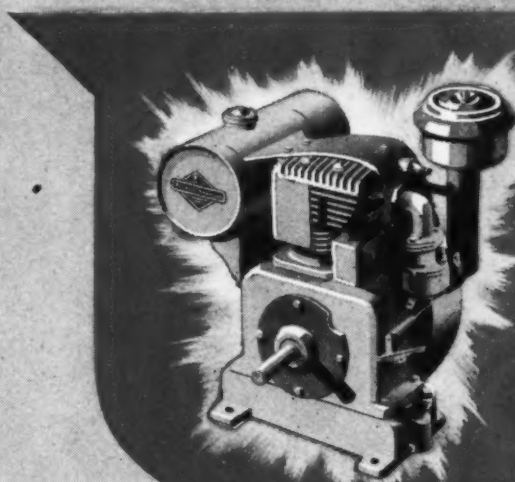
New Hose Coupling

device is stated to completely eliminate danger of accidental uncoupling of hose lines even under the roughest service conditions, yet permits instant and easy engagement or disengagement of couplings when desired.

12.

New Abrasive Wheels

A new addition to its line of abrasive wheels announced by Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N. J., are resin bonded diamond wheels for grinding carbides and carbide tipped tools. An exclusive feature claimed for Manhattan diamond wheels is the special resin bond which has been developed not to load or glaze when coming in contact with soft or hardened tool steel shanks of carbide tipped tools. The economy of this feature, according to the manufacturer, is realized in full wheel life through the elimination of the dressing or lapping usually necessary on other wheels in order to clean the bond. Manhattan resin bond diamond wheels are said to be faster and cooler cutting on car-



Preferred Power
FOR INDUSTRIAL
CONSTRUCTION
RAILROAD AND FARM
EQUIPMENT

BRIGGS & STRATTON ENGINES

The 3-Way Power Choice

- 1 **MANUFACTURERS** select compact, precision built Briggs & Stratton engines because experience proves they provide the **RIGHT** power to operate their equipment at maximum efficiency.
- 2 **DEALERS** choose to sell equipment powered by rugged, instant-starting Briggs & Stratton engines, because it pays to sell equipment that's powered **RIGHT** for long life — and requiring minimum servicing.
- 3 **USERS** insist on equipment powered by Briggs & Stratton air-cooled engines, because of their world-wide record for dependable operation.

More than 2¾ million Briggs & Stratton engines built during the past 26 years furnish conclusive proof that "It's powered RIGHT when powered by Briggs & Stratton".

BRIGGS & STRATTON CORPORATION
Milwaukee 1, Wisconsin, U. S. A.



Air-Cooled Power

"KEYED
(for safe, smooth)
ACTION"



Keystone PAVING JOINTS Lead the Way

Keystone

**Center Strip
FOR
LONGITUDINAL & TRANSVERSE
Keyed Joints**
"TONGUE and GROOVE"

...to millions of feet of job-tested installations throughout the United States. KEYSTONE Asphalt Mastic Board Center Strip provides the Tongue and Groove "keyed action" that engineering authorities demand for today's smooth, safe paving jobs.

The principle of expansion and contraction joints designed to absorb the shrinkage and creeping of concrete under varied weather conditions has been universally accepted. In common use, tongue and groove joints (with or without dowel bars)—because of their "keyed joint" action—have proved an efficiency vastly superior to all existing types. Through this "keyed joint" action, maximum load transmission is assured when pre-formed KEYSTONE center strip is used both longitudinally and at 15 foot spacings transversally. Rigid, water-proof, easy to handle



Ask about the NEW KEYSTONE EQUIPMENT LINE

KEYSTONE offers contractors a joint slitting machine, concrete curing compound spray machines and rubber asphalt joint sealing compound kettles at accepted manufacturer's prices directly from KEYSTONE Products Company. Write or wire.

KEYSTONE ASPHALT PRODUCTS COMPANY

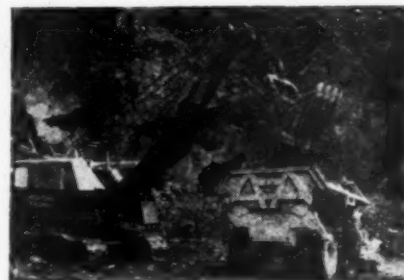
A Division of the American-Marietta Company
43 E. OHIO STREET, CHICAGO 11, ILLINOIS

bides. A complete line of wheel types and shapes is available in grit sizes from 60 to 400.

13.

New 2½-yd. Shovel

A new heavy-duty, all purpose shovel, dragline, clamshell and crane has been announced by Marion Power Co., Marion, O. This is one of three new Marions since V-J Day. This Marion 93-M is a full-rated 2½ c. y. machine designed for mining, quarrying and large-scale construction projects, particularly those involving ore



Marion 93-M 2½-yd. Shovel

and rock. Features of the new machine include Marion air control, ease of convertibility to dragline, clamshell and crane service, ease of preparation for railroad shipment, simplicity and accessibility of all machinery and moving parts, careful proportioning of rugged construction and ample power for heavy-duty service. Shovel front-end equipment includes an all-welded, rounded-edge, box section dipper handles and a heavy duty manganese-steel-front dipper with inserted, socket-type dipper teeth. For dragline or clamshell service, varying boom lengths and bucket combinations are available as job conditions may require. A live boom hoist is standard equipment, making the machine particularly adaptable for crane service.

14.

New 3½-S Mixer

An improved 3½-S Dandie and discharge concrete mixer has been announced by the Kwik-Mix Co., Port Washington, Wis. End discharge feature leaves wheelbarrow spotting area unobstructed, eliminates turning and backing with loaded wheelbarrow. Mixer can be approached from either side or from the end. Kwik-Mix 3½-S Dandie end tilter rides on leaf springs. Wheels run on anti-friction bearings. The mixer has an air-cooled engine. Big hand wheel makes it easy to tilt loaded drum for discharge. To move

the Kwik-Mix 3½-S end tilter, tow pole is pushed down, not up. High strength steel is used wherever extra strength is needed. Mixing action is thorough with four mixing blades.

15.

New Concrete Cart

An improved concrete cart of the dumpover type has recently been put in production by W. E. Grace Manufacturing Co., Dallas, Tex. Features are Timken bearings and dumping



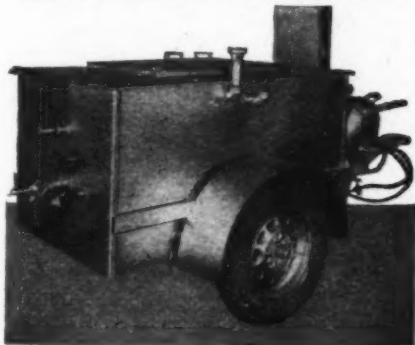
Grace Concrete Cart

with the wheels and axle remaining on the ground. First quality automotive tires or implement tires are available in the 6.00-16 or 5.50-16 sizes. The cart has a struck measure capacity of 7½ cu. ft.

16.

New Bituminous Kettle

A special compound kettle for heating bituminous fillers containing rubber has been developed by the White Manufacturing Co., Elkhart, Ind. This unit has an inner kettle to contain the filler compound. It is surrounded by an outer kettle containing a heat transferring agent, such as special oil. The two kettles are mounted in regular kettle housing, completely insulated by asbestos. Two White kerosene burners are furnished for rapid start-



White Model F-10 Kettle

ing. The oil is raised to 500° in from 30 to 45 minutes and that heat maintained with one burner. The oil can be heated to any temperature up to its flash point of 750°. It is stated the compound in the inner kettle gradually

*Here's a little trailer
that does a BIG trailer's job*



The W-W 10-15 Ton Low Bed



Springless low-bed full trailer type

This type light trailer has been found most versatile by construction companies, State and County highway departments and for heavy hauling contractors.

Weighing only 6400 pounds, it provides easy pull, yet it is so strongly constructed, so sturdily built, it takes loads up to 15 tons with ease.

If your heavy hauling problem seldom exceeds the 15-ton limit, this W-W Low-bed is the answer. If you need a trailer with 20 to 60 ton capacity Winter-Weiss has the answer for that too.

Immediate Delivery on any standard 10-15, 20 to 40 ton semi or full trailer types.

Coupon brings pictures, specifications on any type low bed desired. Simply attach to your letterhead and mail today.

Mail today

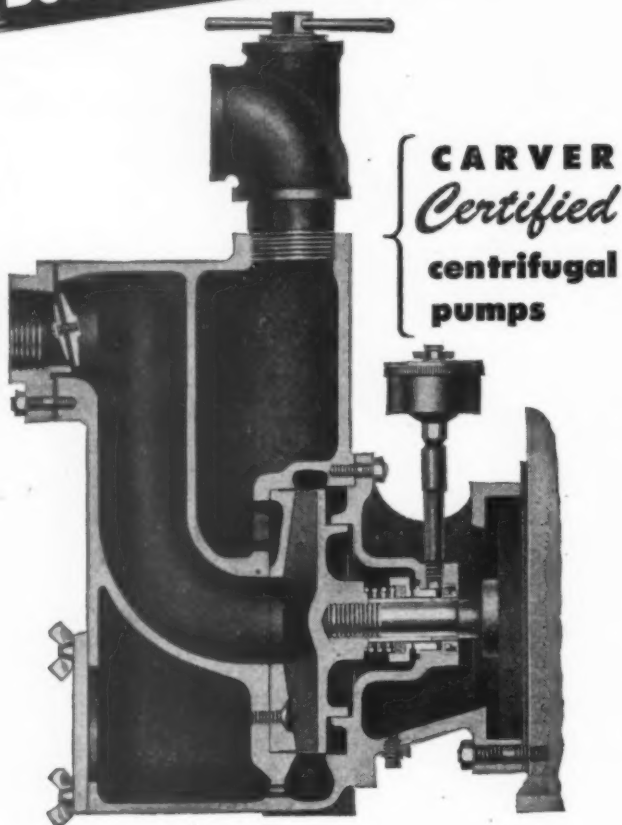
The WINTER-WEISS Co.
22nd & Blake Sts. Denver 2, Colorado

Gentlemen: Please send me complete information on W-W Low Bed machinery trailers. We are particularly interested in aton capacity model.

Firm Name.....
Address.....
City.....Zone.....State.....
By.....Title.....



Here's the Inside Story of Better Pumping Performance



- ★ High Capacity at high suction lift.
- ★ High Efficiency at high pressures and at slow speeds.
- ★ Non-Recirculating—no priming gadgets.
- ★ Life-Time Seal — wearing surfaces are almost diamond-hard.
- ★ Fewer Working Parts because of simple design.
- ★ Non-Clogging — streamlined design.
- ★ Performance of each pump is certified.

Capacities from 3000 to 200,000 GPH. Sizes 1½" to 10". Ask for Bulletin 101-A. Carver Pump Co., Muscatine, Iowa.

CARVER PUMPS

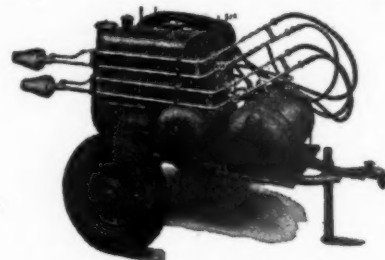
Muscatine Iowa

raises to proper temperature without any hazard of coking or over-heating. The inner kettle is divided by screen into two sections, so that during operations compound can be added to front section to melt and flow through to rear section. Screen prevents passage of semi-molten material to obstruct kettle outlet. In rear compartment of the compound kettle is a hand operated paddle-type agitator for stirring compound. This moves through 160 degrees. Because of the heavy viscosity of this compound, especially prior to its critical melting point of 375°, a motor-operated agitator is considered inadvisable. Each kettle is provided with bi-metal dial thermometer, read from rear of unit, with 500° range for compound and 750° range for heat-transferring oil bath. The new White Model F-10 is mounted in steel frame with towing eye and non-collapsible steady rest, on semi-elliptic springs and pneumatic tires.

17.

New Power Driven Burner

A new power burner, designed to provide a large portable self-contained piece of equipment to provide high temperature flame, has been released by Aeroil Products Co., West New York, N. J. This new, self-contained "Aeroil-Schramm Power Burner" is the result of the combined



Aeroil-Schramm Power Driven Burner

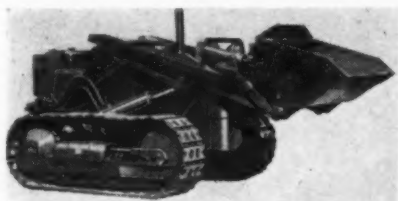
engineering and production resources of two companies. The engine and compressor unit is manufactured especially by Schramm to work in conjunction with the very latest of tank and burner equipment manufactured by the Aeroil Products Co. The type of burners (two are provided) used on this unit make it possible to work in a vertical as well as horizontal position without affecting the volume or density of the flame. By regulating the air and fuel valves, any type and length of flame can be produced—6 in. to 15 ft. long. The new type of burner designed by Aeroil requires no special fuel—it will operate on kerosene or any oil up to a No. 3 fuel oil. When necessary, this machine can be used as a "dual purpose" unit, for the 30 cu. ft. displacement of air is

ample to run the majority of small air tools required around the average industrial plant, shop, yard, etc. The skid model can be mounted on a highway truck, and with the addition of a pressure tank and spray bar can be used to spray emulsions and concrete curing materials.

18.

New Bulldozer-Shovel

A new bulldozer-shovel, specifically built into the International T-D and TD-9 Tractor, has been announced by Frank G. Hough Co., Libertyville, Ill. This Model 9-A is a dual purpose unit, and may be equipped with either a full track width 1 yd. bucket or bulldozer blade. Since the Model 9-A was



Model 9-A Equipped with Bucket

specifically designed and built into the tractor, the original tractor balance, stability and traction are maintained with both blade or bucket. The bucket is raised, lowered, dumped and re-latched entirely by hydraulic control. The bucket tilts back automatically in carrying position preventing spillage. Overhead and side structures are eliminated contributing to full 360° visibility while digging, carrying or dumping, as well as assuring better balance and stability, with reduced wear on front track rollers and idlers. A long, high dumping reach is provided for dumping into trucks, hoppers, etc. Unique design of push-arms provides a powerful crowding action in digging range, and fast hoisting action thereafter.

MANUFACTURERS' LITERATURE

19.

Bulldozers and Snowplows

Trojan bulldozers and snowplows are illustrated and described in a new circular of Contractors Machinery Co., Inc., Batavia, N. Y. Ten reasons why the bulldozers move dirt quickly and economically are given. This equipment is equipped with a patented parallel blade lift which is explained and illustrated.



Add Extra Hours to... OPERATING SCHEDULES!



Plenty of light on the job, with Onan Electric Plants

All the illumination you need for night operation . . . inside shovel cabs, spot-lighting dangerous obstacles, or flood-lighting entire work areas.

Onan plants have many advantages as a source of power for lighting on the job. Can be truck mounted, installed in or on construction machinery, or even carried by hand depending on size. Capacities range from 350 to 35,000 watts. Onan gasoline engine powered, they are easy to start. Built as a compact single unit with Onan generators direct-connected for permanent alignment.

Lighting is only one of many uses for Onan-generated electricity. Used extensively in the field for powering electrical tools, pumps and other motor-driven equipment.

D. W. ONAN & SONS INC.

2815 Royalston Ave., Minneapolis 5, Minn.



Plant shown is Model W35, 3000 Watt A. C.

CHECK ✓

PRIME MOVER: ONAN 4-cycle, one and two cylinder gasoline engines. Air or water-cooled. Four and six cylinder heavy-duty industrial engines on larger models.

GENERATOR: ONAN. Direct-connected to engine. Inherently regulated. Self-excited. Heavy-duty construction. Drip-proof.

STARTING: Manual, electric push-button at plant, remote control, or automatic.

ONAN Electric Plants are available in many sizes and models.

ALTERNATING CURRENT: 350 to 35,000 watts in all standard voltages and frequencies.

DIRECT CURRENT: 600 to 10,000 watts, 115 and 230 volts.

BATTERY CHARGERS: 500 to 3,500 watts, 6, 12, 24 and 32 volts.

WRITE FOR FOLDER

20.

Prefabricated Lumber

The growth of the prefabricating lumber business in recent years from a mere handful of companies to over 76 companies with 131 locations in 38 states is shown in a new directory just issued by the Timber Engineering Co., Washington, D. C., for the benefit of specifying buyers. The listing gives the names and addresses of firms and shows the type of structures they fabricate. Information is also given showing those firms who have facilities for treatment of fabricated lumber with preservatives or fire retardants. Types of structures offered include all types and spans of roof trusses and structural framing, bridges, towers, power line poles and cross arms, glued laminated construction and housing. Information is also given on the engineering, design, wood

products development and wood chemistry laboratory facilities of the Timber Engineering Co.

21.

Truck and Bus Cleaning

A 64-page handbook, "Truck and Bus Cleaning Manual," has been issued by Magnus Chemical Co., Inc., Garwood, N. J. It provides information on latest methods and material for providing fast, thorough and economical cleaning with minimum labor with particular reference to preventive maintenance. Some of the subjects discussed include: Motor and chassis cleaning; sludge prevention and control; cleaning carburetors, fuel and water pumps, etc.; cleaning of cooling systems; cleaning of truck and bus bodies; and cleaning floors, walls and shop surroundings.



by the world's exclusive roller specialists. A low pressure, ample capacity hydraulic steering circuit, plus an efficient clutch shifter, insure easy and prompt response to operator's touch. Notice the simplified clutch shifter mechanism illustrated at the right. It is easy to see why Buffalo-Springfield rollers last longer with lower maintenance costs. See your Buffalo-Springfield distributor today.

BUFFALO  **SPRINGFIELD**
SPRINGFIELD, OHIO

22.

Screening and Crushing Plant

The new Cedar Rapids portable secondary Hammermill unit is featured in a bulletin issued by Iowa Manufacturing Co., Cedar Rapids, Ia. The specifications for this new unit include the following:

Feeder and Hopper: Detachable from truck frame. Feeder 30 in.—reciprocating, clutch controlled, adjustable feed stroke. Charging hopper 6 ft. x 6 ft. with adjustable feed gate, electric welded construction. . . . **Feed Conveyor:** 30 in. x 30 ft. channel frame type with lubricant packed life sealed bearings Cedarapids horizontal vibrating "AG" screen 48 in. x 12 ft. double deck with feed box. Top deck 14 ft. long. . . . **Cedarapids Hammermill:** 3033 or 4033 with full 180° grate area for high capacity 33 in. hammer swing diameter, spherical self-aligning bearings. . . . **Elevating Wheel:** 75 ft. drum diameter x 22 in. wide. Trunnion mounted, anti-friction bearings. . . . **Fines Conveyor:** 30 in. x 21 ft. clutch controlled, channel frame, ball bearing, truck loading. . . . **Rock Conveyor:** 24 in. x 20 ft. clutch controlled, channel frame, ball bearing, truck loading. . . . **Truck:** 8 ft. 0 in. wide—traveling length 42 ft. 2 in.—traveling height 12 ft. 3 in.—height to top of feeder 7 ft. 6 in.

23.

Timber Preservation

Information data on C-A (Carbolineum America) wood preserver are given in a booklet "Stop That Rot" issued by C-A Wood Preserver Co., St. Louis, Mo. It describes and visualizes how preservatives are made; shows visualized and comparative analyses on C-A wood preserver; and tells how much penetration is necessary to retard decay.

24.

Metallic Packing

A new catalog showing in detail major items in the P-M metallic packing line is now ready for distribution by Paxton-Mitchell Co. and its subsidiary, Paxton Diesel Engineering Co., of Omaha, Neb. The first section lists and displays P-M standard piston rod packing assemblies, valve stem and tandem style rod packing assemblies, steam pipe slip joint assemblies, and packing accessories. The second section is devoted to products of Paxton Diesel Engineering Co. Detailed descriptions with large illustrations give important information about the Bearing watchdog system which "in-

spects bearings while engine is running." The Safe-N-Ezy valve spring depressor for one-man dismantling and assembling of Diesel engine valves and the Bingham sleeving process for reclaiming crankshaft journals are also shown. A 32-page installation and maintenance manual also is offered to shops servicing P-M packing.

25.

Power Take-Offs

A bulletin describing 7 models of Davey heavy duty power take-offs has been announced by the Truck Equipment Division, Davey Compressor Co., Kent, O. The bulletin lists take-off operating principles, gives installation data and complete specifications. Emphasis is placed upon Davey's internal and external gear drive design. Also described are various types of truck-mounted power equipment which can be driven advantageously through take-offs.

26.

Suction Hose

A new 4-page illustrated folder covering Monarch water suction hose has been issued by Hewitt Rubber Division of Hewitt-Robins, Inc., Buf-

falo, N. Y. This hose is designed particularly for all heavy-duty pumping operations in the construction and mining fields and is claimed to withstand the most severe conditions of exposure to corrosion and abrasion.

27.

Small Hydraulic Couplings

A new series of small hydraulic couplings for application to electric motors and internal combustion engines in the 1 to 25 HP range are featured in Production Road, a bulletin of Twin Disc Clutch Co., Racine, Wis. These couplings supplement the already established line of heavy-duty Twin Disc hydraulic couplings and retain all of the same proved features.

28.

Oil Filters

The new standard line of Briggs oil filters is illustrated and described in a booklet of the Briggs Filtration Co., Bethesda, Md. How the filter works is illustrated and explained. The filter elements for these units are made from materials developed and manufactured under laboratory control solely for oil filtration. Specifications and dimensions for 15 models are given.

29.

Generating System

Basic details of its new A.C. generating system for automotive vehicles are given in a bulletin of The Leece-Neville Co., Cleveland, O. This new system includes an alternator with rectifier—replacing the conventional D.C. generator—and a regulator incorporating the patented double contact design on the voltage regulator. The outstanding characteristic claimed for this alternator is the ability to operate safely—both electrically and mechanically—over a wide speed range.

30.

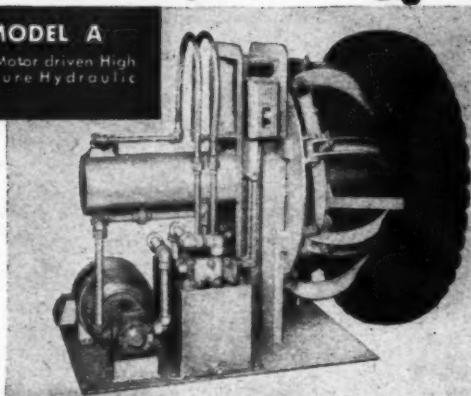
Soil Stabilizer

A new illustrated bulletin describing the new P & H single pass soil stabilizer has been published by Harnischfeger Corporation, Milwaukee, Wis. The machine is designed to make use of on-the-spot materials in building sub-grades, secondary roads, airports, etc. It is stated to be able to perform all stabilizing operations in a single pass. These include shaving and pulverizing the in-place material; thorough blending; application of liquids; final mixing; and spreading to a uniform depth.

NEW • QUICK • EASY

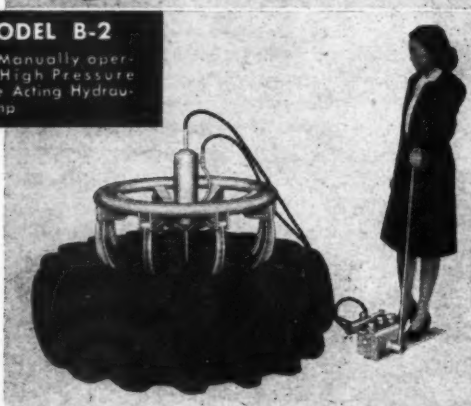
MODEL A

With Motor driven High Pressure Hydraulic Pump



MODEL B-2

With Manually operated High Pressure Double Acting Hydraulic Pump



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TIRE DEMOUNTERS

- Demount all rim sizes from 7.00-15 to 24.00-24
- Develop pulling pressures in excess of 60,000 lbs.
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Presto Tire Demounters easily remove the most difficult types of tires for trucks, buses, earthmoving equipment and other heavy vehicles. No injury to tire, tube, wheel or rim. Adjustable for all size tires.

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STATE

Why "Know How" Contractors

Prefer Rugged

SAUERMAN LONG RANGE MACHINES

Picture shows Sauerman Power Scraper of smallest size cleaning out a pond and at the same time creating valuable real estate by spreading excavated material over marshy area along one side of pond.



- 1 Operated by ONE MAN
- 2 Digs, Hauls, Dumps in ONE Operation
- 3 Low initial cost
- 4 Easily maintained

Sauerman Scraper and Cableway machines are made in all sizes to take care of all jobs from smallest to largest. Electric, gasoline or Diesel power.

Write or wire for complete Sauerman Catalog.
Let us advise you on your specific jobs.

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SINCE 1909

SAND-SPREADING ASSIGNMENT

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**SINGLE
CYLINDER
HEAVY-
DUTY**



WISCONSIN *Air-Cooled* ENGINE

This unique piece of equipment is a street and highway sander, designed and manufactured by Carroll Machine Works, St. Paul, Minn. Powered by a Model AHH single cylinder Wisconsin Air-Cooled Engine, this machine has a capacity up to 1 cu. yd. per minute, and spreads material evenly, in a full circle or directionally from 8 to 30 ft.

In this type of outdoor operation, it is vitally important, of course, that the power unit not only be of rugged, HEAVY-DUTY design and construction, but also that it be adapted to ALL-WEATHER SERVICEABILITY. These are factors that are basic in all Wisconsin Engines.

Wisconsin Heavy-Duty Air-Cooled Engines are made in a complete range of sizes (single cylinder and 4-cylinder models) from 2 to 30 hp. Descriptive literature on request.



WISCONSIN MOTOR Corporation
MILWAUKEE 14, WISCONSIN

World's Largest Builders of Heavy Duty Air-Cooled Engines

31.

Concrete Curing Materials

Reardon Industries of Cincinnati, O., makers of Sure-Cure for curing concrete pavements and roads, announce that tests are under way in their laboratories and outside to determine the percentage of reduction of carbon dioxide action on portland cement when cured with curing compound as compared with moist coverings. Data on this project are now available.

(Continued from page 73)

"lick them up." "The boss engineers go away from these national committee meetings and agree to take care of such matters," this speaker said, "but the field organization goes ahead with the same old rules. Construction engineers ought to tear into their own field staff every time they go out." Likewise it was said that local PRA engineers do not carry out the well-defined policies on the books in Washington.

"There are blade operators and blade operators," noted another delegate. Some contractors can't meet backslope requirements with machines. Why must we have a perfect plane when a few undulations will be pleasing and all but invisible after a year of sod or turf growth? It's high time to relax the specs here.

Missouri's construction engineer, J. J. Corbett, summed up by saying that every job should be studied and more use made of special provisions rather than standard specifications. Money can be saved by greater effort to make use of local material and cut down on expensive borrow.

Rubbing Concrete

Rubbing concrete structural surfaces, as still required by many states, does more damage than 50 years of weathering, claimed Richard Hopkins, contractor from Albany. Some railroads, such as the Delaware and Hudson, specifically forbid this practice.

Commissioner MacDonald told of PRA's resumption of a training program for young engineers, and of the practice of sending competent men to diagnose specifications with the help of contractors. All parties are concerned with diagnosing errors, hidden waste and courses of inefficiencies, as a key to progress. Sub-surface profiling by inexpensive methods is due soon.

Increased Revenues?

Following a rambling discussion of

labor problems, the joint committee briefly considered the urgent problem of getting increased highway revenues in many states. In Washington state, several users associations have joined to battle for, rather than against, a gas tax increase, which is contrary to user group policy in most states. The highway department is the proper organization to start the ball rolling, it was agreed.

(Continued from page 61)

phalt runways; separate airports for air freight; airparks; disposal of surplus airports and operating equipment.

Scope and purpose of the federal-aid airport program; granting privileges for the sale of aviation gasoline and oil; reflectorized markings; economies which are effected by super-compaction of soils under pavements; significance of subgrade-support; the use of clean granular materials in base courses; relationship of subgrade-support to thickness of flexible pavements for airports; super-compaction of subgrades and base courses; using vertical sand drains to speed settlement of muck-filled sites; night airport marking.

Airport drainage; the geometrical

layout of airports, and the need for master plans for airport development; airport drainage with clay pipe; scheduling federal aid for airports; advantages of expert public relations-advice in stimulating airport development; current and prospective airport legislation; airport zoning; making airports self-sustaining; financing sponsors' share of airport costs.

Other sessions will be devoted to the American Institute of Local Highway Officials, municipal problems, developments in construction equipment, and a symposium on vehicle weights and sizes, sub-bases for pavements; rigid pavement design; flexible pavement trends; and broad topics of administration and planning.

Booklets, Pamphlets and Reports Received

Airport Drainage. A remarkably comprehensive and well prepared technical summary of practice, issued by the Civil Aeronautics Administration, Washington, D. C. Its 80 pages include chapters on characteristics and purposes of drainage; hydrology

of airport drainage; grading for drainage; design of the drainage system; and methods of construction. Fifty figures and charts. Available at price of 50c from Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Special Papers on the Pumping Action of Concrete Pavements; 1946. Compiled by the Highway Research Board committee on this subject, edited by the Board's associate director, Fred Burggraf, and issued as Research Report No. 1 D, 1946 Supplement. 60 pages of useful material, including data from N. Carolina and Kansas. 2101 Constitution Ave., Washington, D. C.

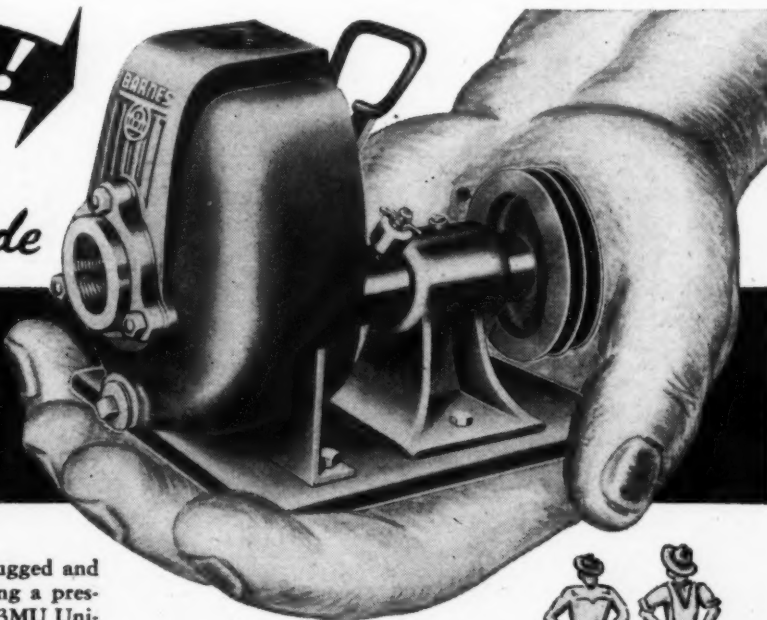
Nineteenth Annual Highway Conference of University of Colorado, Highway Series No. 19, published by the University at Boulder. Papers on traffic safety and accident problem.

Proposed System of Trafficways for Detroit—Master Plan—A well presented popular summary with maps, charts, artists sketches and other visual aids for gaining public support for the program. Issued by the Detroit City Plan Commission, Dec., 1946, as No. 4 of a series, Geo. F. Emery, Secretary and Director.

This is it!

**THE PUMP THAT'S
The Talk of the Trade**

**BARNES NEW UNIVERSAL
DRIVE 1½-INCH AUTOMATIC
CENTRIFUGAL PUMP...**



It's feather-weight and midget-sized—but as rugged and as potent as the atom when it comes to delivering a pressure-packed torrent of water—is this brand new 3MU Universal Drive 1½-inch Automatic Centrifugal Pump. And it's designed to utilize any power source—belt driven from tractor, jeep or any gasoline engine or direct shaft-coupled to electric motor.

So light (35 lbs.) it can be carried with one hand, its powerful non-clogging impeller will cascade a torrent of water up to 5700 gallons an hour with

pressure up to 35 pounds per square inch. The same Automatic Prime, Barnes Superseal, Direct Flow Suction, Non-Clogging Impeller and all other special features found in Barnes' famous "33,000 for 1" Pumps are in the new 3MU Automatic Centrifugal. It's the handiest implement on the place for contractors, industrial plants, municipalities, farmers and gardeners or wherever a power source is available.

You get all these in Barnes' New 3MU Automatic Centrifugal Pumps, plus the fact that they are now ready for delivery. If you order now, there'll be no waiting.



(Continued from page 96)

over to 1947 are tabulated below:

Uncompleted Contracts Carried Over to 1947

	Miles	Est. Cost
Graded and drained....	7.8	\$ 714,271
Gravel surf.	42.8	1,955,699
Mixed bit.	174.6	3,490,296
Bridges, 3		160,090
Grade cross. sep., 1....		217,964

Arizona

State highway construction costing \$3,160,000 was completed in 1946. The principal item was 125 miles of mixed bituminous at a cost of \$2,560,000. In addition 5 miles of concrete at a cost of \$510,000, 1 mile of gravel surface, \$30,000 and 1 bridge \$60,000 were completed.

Uncompleted contracts for 98 miles of state highway, estimated to cost \$3,800,000 were carried over to 1947. These projects were as follows:

Uncompleted Contracts Carried Over to 1947

	Miles	Est. Cost
Graded and drained....	21.0	\$ 800,000
Bit. surf. treat.	16.0	700,000
Mixed bit. surf.	49.0	2,200,000
P. C. concrete.....	8.0	900,000

The proposed construction program for 1947 calls for an expenditure of \$9,000,000.

Utah

State highway completed in 1946 comprised 8.6 miles of mixed bituminous construction at a cost of \$271,000. Uncompleted contracts carried over to 1947 covered 139.2 miles of highway, estimated to cost \$3,977,000. Details of these contracts follow:

Uncompleted Contracts Carried Over to 1947

	Miles	Est. Cost
Graded and drained....	13.3	\$ 620,000
Gravel surf.	29.8	325,000
Mixed bit.	90.3	1,540,000
Dual type	5.8	814,000
Bridges, 12		678,000

The proposed state highway construction program for 1947 calls for an estimated expenditure of \$6,050,000. It includes the following:

Proposed State Highway Construction for 1947

	Miles	Est. Cost
Graded and drained....	29.6	\$1,310,000
Gravel surf.	31.0	290,000
Mixed bit.	165.2	3,500,000
P. C. concrete.....	3.7	510,000
Bridges, 5		440,000

Nevada

During the calendar year 1946, 64 miles of mixed bituminous surface road was completed at a cost of \$1,800,000; and 11.93 miles of gravel surface road was completed at a cost of \$145,000.

Uncompleted contracts carried over to 1947 consist of the following road types:

	Miles	Est. Cost
Mixed bit.	104	\$2,858,000
Gravel surf.	80	712,000

Construction proposed for the calendar year 1947 consists of:

	Miles	Est. Cost
Mixed bit. surf. type....	140	\$4,317,000
Gravel surf.	95	840,000

Pacific States Washington

State highway construction costing \$6,550,000 was completed in 1946 and uncompleted contracts estimated to cost \$7,500,000 were carried over to 1947. Details of this work follow:

State Highway Mileage Completed in 1946

	Miles	Est. Cost
Graded and drained....	60	\$2,500,000
Gravel surf.	13	120,000
Stone surf.	93	1,200,000
Bit. surf. treat.	175	440,000
Mixed bit.	27	100,000
Bit. seal coat.....	313	470,000
Bit. concrete	15	400,000
P. C. concrete.....	7	420,000
Bridges, 38		860,000
Grade cross. sep., 1....		50,000

Uncompleted Contracts Carried Over to 1947

	Miles	Est. Cost
Grad. and surf.	107.0	\$4,000,000
Bit. surf. treat.	206.0	500,000
Asphaltic conc. pav. ...	8.4	200,000
P. C. concrete.....	16.6	1,200,000
Bridges, 33		1,600,000



The Leader IN WELDED CONSTRUCTION WELLMAN Williams Type BUCKETS

Wellman pioneered in the welded construction of rolled steel buckets. Priceless experience, superior engineering and the finest type of construction guarantee you more satisfaction from your Wellman-built buckets.

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THE WELLMAN ENGINEERING COMPANY
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The tentative construction program for 1947 calls for an estimated expenditure of \$19,000,000 for the following work:

Proposed State Highway Construction for 1947

	Miles	Est. Cost
Graded and drained....	170	\$8,000,000
Stone surf.	250	4,900,000
Bit. surf. treat.	300	650,000
Mixed bit.	20	150,000
Bit. concrete	31	1,000,000
P. C. concrete	21	1,300,000
Bridges, 34		2,700,000
Grade cross. sep., 4....		300,000

Oregon

Contracts for state highway construction amounting to \$6,070,000 were completed in 1946, the work comprising the following:

State Highway Mileage Completed in 1946

	Miles	Est. Cost
Graded and drained....	110	\$3,700,000
Stone surf.	102	1,200,000
Bit. surf. treat.	116	450,000
Bit. Mac.	23	230,000
Bit. concrete	12	360,000
Bridges, 4		60,000
Grade cross. sep., 1....		70,000

Uncompleted contracts estimated to cost \$9,350,000 were carried over to this year. Type and mileage of this work follow:

	Miles
Grading	295
Rock surf.	250
Bit. surf. treat.	280
Bit. Macadam	11
Bit. concrete pav.	22
Bridges, 29	
Grade cross. sep., 5	

The proposed state highway contract program for 1947 calls for an estimated expenditure of \$15,600,000 and is as follows:

Proposed State Highway Contracting for 1947

	Miles	Est. Cost
Graded and drained....	250	\$8,500,000
Stone surf.	250	3,000,000
Bit. surf. treat.	300	1,200,000
Bit. penet.	50	500,000
Bit. concrete	20	600,000
P. C. concrete	15	700,000
Bridges, 20		900,000
Grade cross. sep., 3....		200,000

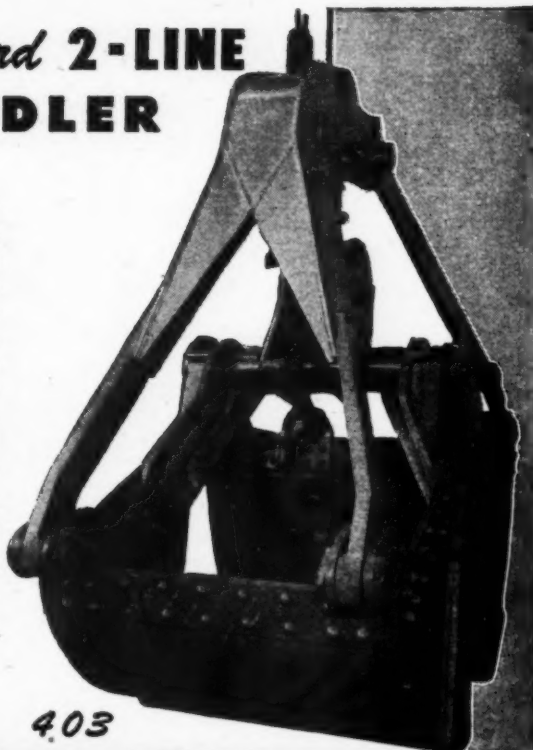
California

The first contracts in the state highway postwar construction program were awarded in December, 1945, but for all practical purposes postwar construction may be considered to have started in 1946. By the end of 1946 the total value of contracts awarded and advertised will have amounted to more than \$75,000,000. Most of the contracts awarded are still under way and an appreciable number of large jobs will carry through 1947.

On Jan. 1, 1947, there remained \$30,000,000 in projects originally scheduled for the first two postwar years (July 1, 1945, to June 30, 1947) yet to be placed underway. It is expected that most of this work will be advertised for bids prior to June 30, 1947, with the possible exception of bridges and grade separation struc-

ERIE Standard 2-LINE REHANDLER

THIS compact Lever Arm Rehandler Bucket of normal proportions has ample closing power to fill to capacity in compact materials, and is so designed that the reeving can be adjusted to obtain maximum speed with capacity grabs in loose materials. We have reduced the "height open dimension" thus requiring minimum headroom, enabling you to pile higher and to discharge into higher hoppers. Lighter weight alloy construction provides more pay load (scoop contents) less bucket dead weight. To see this bucket in all detail write for bulletin 403.



● Write for Booklet 403

ERIE BUCKETS • A Complete Line

Erie Steel Construction Co., 369 Geist Rd., Erie, Pa.

BUCKETS • AGGREGATEMETERS • PORTABLE CONCRETE PLANTS

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**EXACT CONTROL
MEANS FAST,
UNIFORM SPRAYING
WITHOUT WASTE**



One simple, three-way valve controls the entire operation of the Kinney Distributor, from circulating or loading to spraying. This hand-operated valve is the simplest control on the market . . . speedy, leakless, efficient. Complete air-operated controls are also available. A large handwheel convenient to the operator provides wide lateral

control of the spray bar, eliminating waste at road edges. The Kinney Distributor handles all grades of bitumen used in road work . . . tar, asphalt, road oil, cut back and emulsions. Its speedy Rotating Plunger Pump is accurate as a meter and applies material fast and in exact quantity specified by road engineers.

Write for Bulletin A-42.

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We also manufacture Vacuum Pumps, Liquid Pumps and Clutches.

What do you haul?

No matter what the load may be—on or off the road—rain or shine—you're in the right with a rugged La Crosse Trailer.

Field reports have proven that these trailers are built for heavy duty jobs—designed for years of trouble free service—constructed to outlast the average trailer.

"LOOK TO LA CROSSE" FOR TRANSPORTATION
Write for name of your nearest dealer



tures involving structural steel and certain projects, particularly in the metropolitan areas of Los Angeles and San Francisco, which are stymied by reluctance to clear construction sites because of the housing shortage.

The state highway budget for the third postwar year (July 1, 1947, to June 30, 1948), as adopted by the California Highway Commission last Nov. 21, provides \$23,000,000 for major construction projects and \$4,000,000 for surface and base repairs.

There still remain in the original 3-year postwar program approximately \$45,000,000 of vitally needed im-

provements which must be postponed because they cannot be financed unless additional revenue is provided.

WITH THE MANUFACTURERS & DISTRIBUTORS

Koehring Training Course

Koehring Co., Milwaukee, Wis., this month is holding the second of a series of training courses designed to supply Koehring distributor salesmen with complete up-to-date sales information on Koehring products. Attended by approximately 35 men, representing Koehring distributors throughout the country, many of them returned war veterans new in the field, others with a lifetime of experience behind them, the 10-day refresher combines lectures by members of the Koehring sales, engineering and management staffs with ample discussion and question-and-answer periods. Lectures are appropriately illustrated with slides, working models and movies.

Arthur E. Loder, veteran Koehring salesman and Koehring Washington representative during the war years, heads a staff of 25 lecturers including G. E. Long, President; J. R. Steelman, R. A. Beckwith, Vice-Presidents; J. F. Robbins, Koehring Sales Manager, and A. E. Kelbe, Sales Manager, Kwik-Mix Co.

Lectures cover the Koehring line of excavators, pavers, Dumpsters, Koehring construction mixers, mud-jacks, longitudinal finishers, Kwik-Mix Dandie concrete, bituminous and plaster-mortar mixers.

Additional schools, both for sales and service personnel, are being planned throughout the year.

W. L. Sturtevant Retires

W. L. Sturtevant has retired as chemical engineer of the Manhattan Rubber Division plant, Raybestos-Manhattan, Inc., Passaic, N. J. Mr. Sturtevant had been chemical engineer since 1931 and had represented Manhattan on various government and scientific committees. Before 1931 he was chief chemist and assistant superintendent in charge of laboratory, mill and calendar departments. He was appointed to that post in 1917, five years after he joined the firm as a chemist.

Standard Specification for Highway Bridges

The 1944 edition of this book is a complete presentation of the specifications adopted by the Association. In four main Divisions, with 72 subordinate Sections, are covered all details of General Provision, Construction, Design and Materials. Four Appendices carry tables of moments and shears, steel column formulas and graphs, a chart of truck, train and equivalent loadings and a diagram of permissible unit stresses for rectangular concrete columns.

262 pages, 6" x 9", cloth bound, \$2.00 post paid.

Order direct from

AMERICAN ASSOCIATION OF
STATE HIGHWAY OFFICIALS
1218 National Press Building
Washington 4, D. C.

Shunk Snow Plow and Ice Removal BLADES

Proved record of superior performance. Made of specially developed steel to withstand severe service conditions.

FOR ALL TYPES AND MODELS OF SNOW PLOWS
Various widths, lengths, thicknesses—flat or curved—standard or special—punched ready to fit your machine.

SHUNK SAW-TOOTH
ICE BLADE

Amazingly effective. Thoroughly breaks up and removes heavy, slippery ice and snow formations. Replaces all types of snow plow blades or maintenance units. Write for Bulletin and name of nearest Distributor.



Shunk
MANUFACTURING
COMPANY
ESTABLISHED 1854
BUCYRUS, OHIO

Parsons Returns to Link-Belt Speeder

Hayes Parsons has been made assistant to the president of Link-Belt Speeder Corporation, Chicago, Ill., and will have charge of the domestic sales of Link-Belt Speeder "Shovel-Cranes." His headquarters will be at the Cedar Rapids, Ia., plant. Mr. Parsons' long experience in sales dates back to 1925 when he first joined the organization as district representative, covering the West Coast Territory. In successive steps he became assistant sales manager and in 1940 was appointed general sales manager of the company. Late in 1945 he was forced to retire because of ill health. He has since recovered and his many friends throughout the country will be glad to know that he is again actively concerned with the sale of Link-Belt Speeder equipment.

New Le Roi Distributor

Le Roi Co., Milwaukee, Wis., has announced the appointment of E. Carl Price, 18 Little Britain Road, Newburgh, New York, as their exclusive distributor for the New York counties of Orange, Rockland, Sullivan and Ulster.

Appointed Sales Promotion Manager for Pioneer

W. A. Rundquist has been appointed sales promotion manager for Pioneer Engineering Works, Inc., Minneapolis, Minn., to have charge of advertising, sales promotion and sales training.

Graduated in 1929 from North Dakota State College with a degree of B. S. in M. E., Mr. Rundquist was associated with Bell Telephone Laboratories, New York, for seven years, and later was with Minneapolis-Honeywell Regulator Co., Minn., as supervisor of technical information. He served with the Corps of Engineers during the war as a post engineer and later as production liaison officer for the Upper Mississippi Valley Division, then was assigned to the Office, Chief of Engineers as administrative officer, Critical Components Section.



W. A. Rundquist

New Lima Distributor

Lima Locomotive Works, Inc., Shovel and Crane Division, Lima, O., has announced the appointment of Interstate Equipment Co., Statesville,

N. C., as sales agent for Lima shovels, cranes and draglines in the state of North Carolina.

Appointed Sales Manager

Austin K. Thomas has been appointed sales manager of construction machinery division of Chain Belt Co., Milwaukee, Wis. Mr. Thomas has a background of over 20 years' association with the



A. K. Thomas

construction machinery industry. After graduating from the College of Civil Engineering of Cornell University, he spent several years in active construction work. Next, he entered the employment of a large Eastern manufacturer of construction machinery, working first as a service engineer, then as a member of the sales department, and lastly as manager of a district sales office. He then joined the organization of a construction machinery distributor. After becoming affiliated with Chain Belt Co., Mr. Thomas was named Eastern district manager, with offices in Philadelphia. During the war years, his office was located in Washington, D. C.

ON GUARD!

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- .. CURVES
- .. EMBANKMENTS
- .. GRADE
- CROSSINGS
- .. BRIDGE
- APPROACHES

with

TUTHILL GUARDS

TUTHILL Highway Guard has that combination of features Highway Engineers like so well: A high degree of safety, easy installation and low upkeep expense. Made of strong steel, with panels cut to convenient length, this Guard is easy to install. Its strength to resist impact, and yet stand erect, means greater safety, besides a neater-looking, more permanent job. Proof? The hundreds of TUTHILL Guards along America's scenic highways. Available for maintenance or installation. Write for details.

Pacific Coast Manufacturers and Distributors:
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HOT or COLD Mix Asphalt

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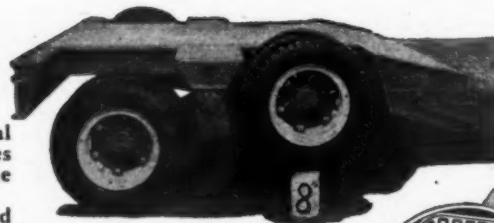
THE SIMPLICITY SYSTEM COMPANY
CHATTANOOGA, TENNESSEE, U.S.A.

A ROCKING BEAM Trailer?

YES HERE IT IS!

• Rogers also builds trailers for unusual needs, embodying characteristic features of fundamental design but modified to meet the special requirements.

For example, consider the above illustrated



ROGERS TRAILER

• This is the new Model T trailer which has two rocking, box-girder sections at each end of which is a spindle, carrying a wheel and two extra large tires. This design gives the desired oscillation and permits building trailers only 8 feet wide in capacities up to 35 tons. This two axle trailer meets the needs existing in some states that limit the ton-

nage that can be carried on one axle.

Write for information on standard or special trailers which have been tested in difficult service.

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EXPERIENCE
builds 'em
PERFORMANCE
sells 'em

Allis-Chalmers Personnel Changes

Harry A. Gratner, agricultural sales manager for the Allis-Chalmers Tractor Division, recently announced the appointment of R. N. Sorenson as agricultural sales manager for the company's Oklahoma City branch office. Mr. Sorenson, successor to the late H. W. Kruger who died Nov. 17, 1946, joined the Allis-Chalmers organization in 1937, and was promoted to



R. N. Sorenson



Ralph L. Heiman

assistant divisional sales manager in 1938. Three years later he was assigned to the sales manager's post at the company's Wichita, Kan., branch. Other changes announced by Mr. Gratner were the appointments of Chas. Evans as sales manager for the

Wichita branch, and Ralph L. Heiman to sales manager at the Allis-Chalmers branch at Amarillo, Tex. Both Messrs. Evans and Heiman are ex-navy veterans who were on leaves of absence from Allis-Chalmers during the war, and returned to their old jobs as block salesmen during the past year.

Director of Purchases

Paul V. Goodman has been appointed director of purchases of the Davey Compressor Co., Kent, O. Mr. Goodman has been a member of the Davey organization since 1929 with the exception of the period from 1935 to 1939, when he served as purchasing agent of the Ohio State Highway Department.

Appointed Vice President

Kenneth T. Fawcett has been appointed vice-president of Dominion Brake Shoe Co., Ltd., a Canadian subsidiary of American Brake Shoe Co. Mr. Fawcett has been associated with American Brake Shoe Co. since 1934 and has been assistant general purchasing agent since 1944.

Gracely New Marion President

Harvey T. Gracely has been elected president and general manager of Marion Power Shovel Co., Marion, O., succeeding M. E. Montrose. Mr. Gracely entered the employ of the Marion Co. in



H. T. Gracely

1901, and in a few years became chief of the dipper dredge section of the engineering department. He resigned in 1914 to engage in drainage contract work in Mississippi. Upon its completion, in 1916 he entered the civilian branch of the U. S. Ordnance Department with headquarters in Cleveland, O. He continued in this position for three years. After the war's end and his release from the Ordnance Department in 1919 he returned to Marion as advertising manager. In 1923 he became assistant sales manager and later general sales manager, holding this position for 14 years. In April, 1944, he was elected a director and a year later, vice president.

Concrete VIBRATORS and GRINDERS

Write for Circular on types, sizes and Prices

ELKHART **White Mfg. Co.** INDIANA

Try a **Pierce-Bear** on that tough job!



3 1/2 TON — VARIABLE WEIGHTS

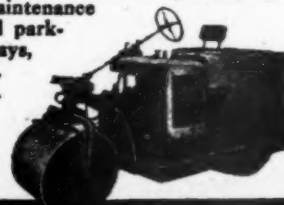
Engineered refinements and rugged strength have earned for these rollers enviable performance records. Compact design gives efficient operation in close quarters. Ideal for maintenance work on highways, airports and parking areas. Fine for driveways, docks, etc. Easy to operate. They do a good job at low cost.

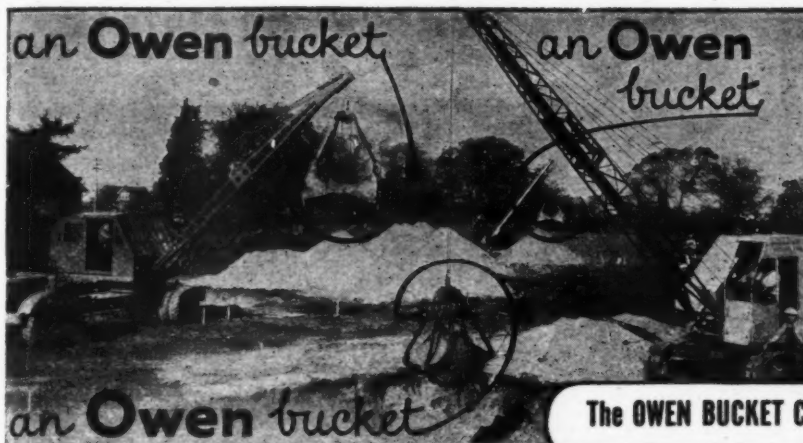
Write for New Illustrated Folder.

MANUFACTURED BY

Lewis Manufacturing Co.
SAN ANTONIO 6, TEXAS

P. O. BOX 300





Three Owen Buckets that we can see are at work on this particular project.

Multiply this by a very large number and you'll get a partial conception of the widespread Owen standardization on the part of progressive contractors everywhere.

There is a new Catalog available now. You'll want to consult it we're certain. A brief line to us will bring your copy to you promptly.



The OWEN BUCKET CO. 6070 BREAKWATER AVE. CLEVELAND, OHIO BRANCHES: New York, Philadelphia, Chicago, Berkeley, Calif.

Caterpillar Tractor Co. Promotions

Because of the addition of new products to its line, and because of expanded productive facilities, Caterpillar Tractor Co., Peoria, Ill., has created the job of parts consultant in its Parts Department with W. B. Gordon, former inventory control manager, appointed to the new position. J. G. Hamner has been promoted from parts technical manager to inventory control manager and H. F. Haven promoted from assistant parts manager, Western Division to parts technical manager. E. L. Mason, who has been central division assistant parts manager, takes the Western Division post vacated by Mr. Haven and C. F. Cummings becomes assistant parts manager of the Central Division.

Elected Mack Director

A. C. Fetzer, vice president, has been elected to the board of directors of Mack Manufacturing Corporation. Mr. Fetzer, who was acting general sales manager, was at the same time appointed general sales manager.

Le Roi Buys Cleveland Rock Drill Co.

Le Roi Co., Milwaukee, Wis., manufacturers of internal combustion engines, portable compressors, engine-generator sets and specialized mowing equipment, has purchased the Cleveland Rock Drill Co. of Cleveland, O. The purchase of this company, a division of The Cleveland Pneumatic Tool Co., substantially accelerates the Le Roi rock drill manufacturing program announced earlier, coincidental with the establishment of Le Roi's Cleveland Division. Included in the purchase were the manufacturing rights to all of the line of rock drills, the jigs, dies, fixtures, patterns, etc., as well as the complete inventory of parts for their manufacture. Russ Morgan, formerly secretary and sales manager of The Cleveland Rock Drill Company, who joined Le Roi over a year ago and who was instrumental in the organization of Le Roi's Cleveland Division, will head the expanded facilities.



Russ Morgan

Lima Promotions

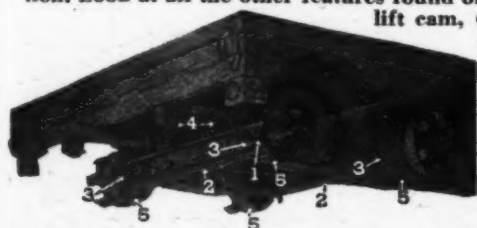
The Shovel and Crane Division of Lima Locomotive Works, Incorporated, Lima, O., has named J. W. Artz Director of Parts Sales and Service. Mr. Artz has been associated with the Lima company since 1928 in the capacity of Parts Sales and Service Manager. Howard W. Read, formerly Assistant Parts Sales and Service Manager, has been appointed Parts Sales Manager, with William D. Lutes, Assistant Parts Sales Manager. T. A. Griffin, formerly Service Engineer for Lima, has been appointed Service Manager of the Shovel and Crane Division.

Meyer Promoted by Sauerman Bros.

Sauerman Bros., Inc., Chicago, has announced the appointment of Martin Meyer as assistant sales manager. This gives D. D. Guilfoil, general sales manager, much needed aid in handling a rapidly expanding market. Mr. Meyer has been engaged in both the sale and engineering of Sauerman scrapers and cableways for the last six years and previously was in railroad construction work.

BE SURE YOUR NEXT TRAILER HAS ALL THESE FEATURES

● Deep, wide flange main beams running the full length of the trailer, I-Beam sections for cross-members and outriggers, improved, fabricated gooseneck, and all electric-welded construction. Look at all the other features found only on Jahn tandem axles: (1) constant lift cam, (2) two full-width axles attached to longitudinal rocker beams, (3) worm gear type slack adjusters at each wheel, (4) heavy coil springs at each axle and (5) positive equalizing braking at each wheel regardless of position of axle.



C. R. JAHN COMPANY
1345 W. 37th PLACE, CHICAGO 9, ILL.

Heavy duty trailers from 5 to 100 tons.



SYNTRON

100% Self-Contained
Gasoline Hammer

PAVING BREAKERS



will
Save You
MONEY
and TIME

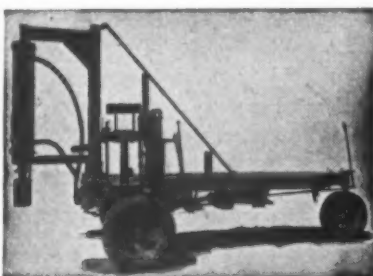
BUSTING
Concrete
DIGGING
Shale & Clay
TAMPING
Backfill

No air compressor—no hose—
no battery box—no cable.

Write for illustrated folder.

SYNTRON CO.
384 Lexington, Homer City, Pa.

RAPID!



Cuts concrete and cuts labor
costs to 2 1/2c per square yard.
Applicable to floor work and dif-
ferent types of inside horizontal
work.

Very efficient in maintenance
work of highways.

Boom folds down and readily
trailed by any light truck. Make
your compressor treble its out-
put by hooking it to this ma-
chine.

**Rapid Pavement
Breaker Co.**

1517 Santa Fe Ave.
Los Angeles 21, Calif.

ARIENS

FOR SECONDARY ROAD
CONSTRUCTION

AGGMIXER



The swirling, chop-
ping action of these
tines does a thor-
ough job of mix-
ing, wet or dry.

Here's equip-
ment designed
especially for
mixed-in-place construction — to
operate in connection with other
general purpose equipment. Where-
ver aggregates are used it thor-
oughly pulverizes, mixes and aer-
ates aggregates with binder—rap-
idly and economically. Also ideal
for soil cement stabilization. Safe
and easy to operate . . . adjust-
able to any tractor . . . made 4
standard sizes, 4', 5', 6' and 7'.
Write for details.

**ARIENS
COMPANY**
BRILLION, WIS.

Appointed Market Research Manager

Robert C. Judd
has been appoint-
ed market re-
search manager
for R. G. LeTour-
neau, Inc., Peoria,
Ill. He will study
applications of
present equip-
ment to present
markets; analyze
applications of
present equipment to new markets;
and study new markets for potential
development of new products. He re-
places Wendell Richards, who resumes
his district sales representative activi-
ties. Before joining LeTourneau, Mr.
Judd conducted his own sales research
firm. Upon his graduation from the
University of Chicago he was asso-
ciated successively with the National
Broadcasting Co.; Batten, Barton,
Durstine & Osborne advertising
agency; Montgomery Ward & Co.;
and the Shaw-Box Crane and Hoist
Division of Manning, Maxwell &
Moore, Inc., Muskegon, Mich. He was
market analyst and manager of the
statistical department for the latter
concern.



R. C. Judd

NOW AVAILABLE

One-man Diesel
Valve Spring Tool

SAFE-N-EZY
Valve Spring
Depressor
CUTS Diesel
Maintenance
COST!



Valents
Pending

Write
Today
for Prices
and Folder

The SAFE-N-EZY Valve Spring Depressor is
designed for one-man operation in dis-
mantling and assembling Diesel engine
valves. Compresses valve spring to any
point, holds it there. Mechanic can have
both hands free. Easy to apply. Sizes to fit
all modern Diesel engines. Rugged, light,
easy to store. Makes Diesel valve dismant-
ling and assembly safe, easy, quick.



PAXTON
DIESEL ENGINEERING COMPANY
OMAHA 5, NEBRASKA

Reliance

CRUSHING, SCREENING
and WASHING UNITS

● Up to 2000 Tons a Day ●

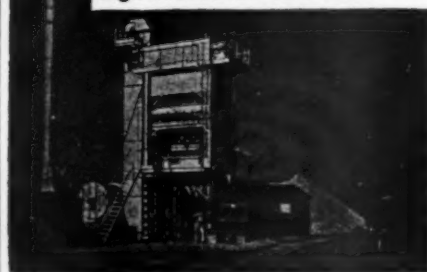
Crushers	Bins	Drag-Lines
Elevators	Fulverizers	"GAYCO"
Sweepers	Feeders	Centrifugal
Screens	Spreaders	Air Separators
Wash Boxes	Kettles	
	Conveyors	

UNIVERSAL ROAD MACHINERY CO.
Kingston, N. Y.

Canadian Representatives: F. H. Hopkins & Co., Ltd.
140 Canada Cement Co., Montreal, Que., Can.

**PORTABLE
ASPHALT PLANTS**

High Production—Low Cost



THE McCARTER IRON WORKS, INC.
NORRISTOWN, PENNA.

**VULCAN PAVEMENT AND
CLAY DIGGING TOOLS**

ARE MADE in a complete line of
sizes to fit all standard compressed air
hammers.

Send for NEW Vulcan Illustrated CATALOG today.



TOOLS — THE WORLD OVER —
NOTED FOR QUALITY AND DURABILITY

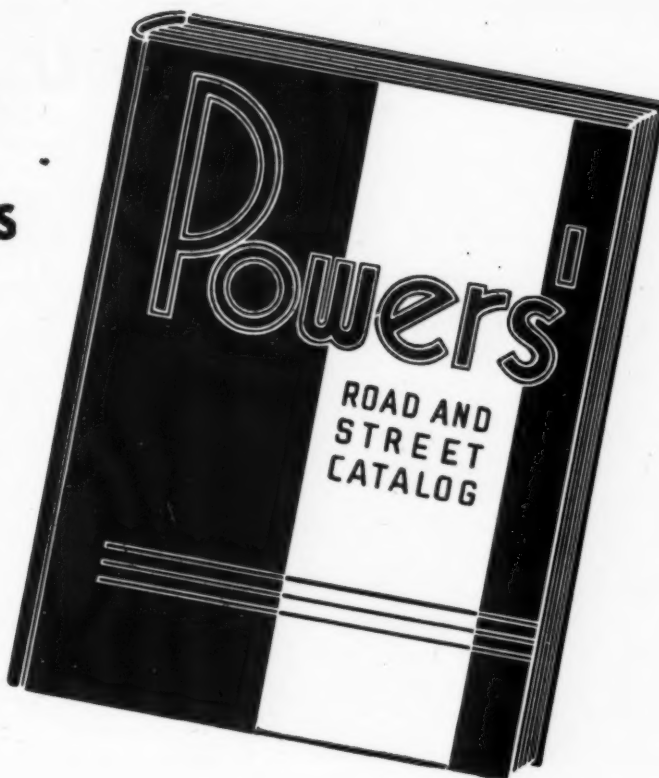
VULCAN TOOL MFG. CO.
QUINCY, MASS.

**MORE THAN 10,000
CATALOGS DISTRIBUTED
MORE THAN 100,000 USERS**

*Next Edition
Coming Up*

HAVE YOU MADE YOUR RESERVATION?

*"Catalog is always within reaching
distance. Wouldn't be without it!"*



A State Highway Engineer made this comment, but practically the same thing has been said by County, City and Federal Engineers; Road and Street Contractors, and Airport Engineers and Managers.

Comments come pouring in from every part of the field in praise of the Catalog and asking to be kept on the list to receive the next edition.

Requests come from the men who plan and design, construct and maintain the roads and streets of the Nation. They are the State, Federal, City and County Engineers; Chairmen of County Boards; Directors of Public Works; Engineers of National Parks and Forests; and Airport Managers and Engineers. They are the Highway and Heavy Construction Contractors who furnish the major market for the purchase of road building equipment and materials.

POWERS' ROAD AND STREET CATALOG offers the most economical and satisfactory method of placing your Catalog information where it will be constantly available to the man "who wants what he wants when he wants it." Here in one compact reference book is all the necessary information on all types of equipment and materials, indexed for easy reference, with names and addresses of nearest equipment dealers.

It is estimated that expenditures for maintenance alone this year will reach the billion dollar mark. To this will be added another billion for new construction and improvements. Step up your advertising for increased buying tempo in this huge market for road building and maintenance equipment and supplies.

AUDITED CIRCULATION — FLEXIBLE CCA

Rate card sent upon request

Write for booklet "What Users and Buyers Want to Know About Care and Maintenance of Equipment."

Gillette

PUBLISHING COMPANY

22 West Maple St., Chicago 10, Ill.
NEW YORK • CLEVELAND • LOS ANGELES
SAN FRANCISCO

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125

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FOR SALE

- 4—Rebuilt Cat. DW10 Tractors with Cat. W-10 Bottom Dump Wagons and Athey PD10 Side Dump Trailers.
- 5—Rebuilt Cat. DW10 Tractors with LaPlant Choate CW10 Scrapers.
- 3—Practically New—Cat. DW10 Tractors with LaPlant Choate CW10 Scrapers in use only 3 months.
- 4—Hug Trucks Model 87Q powered by Cat. D468 Diesel Engine with 6 Yd. Rock Dump Bodies—Fine Shape.

John Fabick Tractor Co.

3100 Gravois Ave.
St. Louis, Mo.

FOR SALE

- 1—Foote Paver\$3,000.00
- 1—Huber Roller, Gas, 10-ton
—3-wheel 1,250.00
- 3—Steam Tandem Rollers (Prices vary)
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Shovels (New), each 500.00
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to 12' 3,250.00
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2,000 lb. box15,000.00

PHIL H. McGUIRE

P. O. Box 34, Norfolk, Va.

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*New or Rebuilt
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Headquarters for REPAIRS—any make. Factory service. We will also buy your old instruments or take them in trade.

A complete line of engineering Instruments and Equipment for Field or Office. Write for Bulletin RS-112.

WARREN-KNIGHT CO.

Manufacturers of Sterling Transits and Levels
136 N. 13th St. Philadelphia 7, Penna.

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AUSTIN-WESTERN 5-8-ton Tandem Roller, latest model. Overhauled. Excellent condition, \$2,800.00.
ETNYRE 1,000-gal. Distributor mounted on 5-ton IHC truck KR-11-162" wheelbase. New 1942. Used little, \$5,000.00.
BROOKS CH-200 & DEMPSTER LF-200 LOAD LUGGERS with 2 cu. yd. buckets. Good. \$500.00 per set.
BUCKYRUS-ERIE 10 B. Dragline, ¾ cu. yd. Good. \$4,500.00.
UNIT, full rev. ¾ cu. yd. shovel, also practically new backhoe. Good. \$5,250.00.
LIPPMANN 24" x 36" r.b. Jaw Crusher, latest model. Long jaws. 32,000 lb. New. \$7,850.00. Also smaller portable jaw crushers, various sizes.
BUDA Diesel 200 H.P. 6LD1742. Power Unit. Overhauled. Excellent. \$3,750.00.
BARBER-GREEN 44C Ditcher. Practically new. \$5,500.00.
CLEVELAND ±150 Ditcher. Like new. \$7,000.00.

M. Wenzel,

2136 Jefferson, Kansas City, Mo.

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A young man to sell road graders, road rollers, through distributing organization. Experience desirable. Midwestern manufacturer. Salary. State age, experience and salary requirements. Box 103,

Roads & Streets, 22 West Maple St., Chicago 10, Ill.

FOR SALE CLIMAX GASOLINE ENGINES

NEW — model V-425, 12 cylinder 425 H.P. at 1200 RPM, gasoline engine power unit complete radiator to twin disc clutch inclusive with gasoline starting engine. Cheaply convertible to natural gas operation. Priced far below factory list, 7 units available. Dealers invited.

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COMPANY**

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Phone East 1125

In
CLEVELAND
IT'S THE
HOLLENDEN



1000 ROOMS WITH BATH
RADIO IN EVERY ROOM
SIX FINE RESTAURANTS
CENTRAL DOWNTOWN LOCATION
GARAGE ATTACHED

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Check reference to advertisement or to items of equipment or materials on which you wish to receive information. Give your name and address in the space at foot of page (if convenient, please print or use typewriter), detach page and mail to ROADS AND STREETS, Readers' Service Department, 22 West Maple Street, Chicago 10, Ill. We will pass your inquiry along to manufacturers and see that you get desired information promptly.

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Be sure to fill in name and address below:

Title

Your Name.....or profession.....

Name of your company
or governmental department.....

Type of work for which
equipment will be used.....

Street Address.....

City.....State.....County.....

Quick Action ... WITH SUPERIOR STRENGTH, SAFETY



"AIR KING"

Quick-Acting, Universal Type HOSE COUPLING

With Auxiliary Locking Arrangement

The most adaptable air hose coupling of its kind. Strong, durable, safe, in outdoor or indoor service. Made of malleable iron (cadmium plated) or brass. Shanks of hose ends are long, amply corrugated and smoothly finished, permitting easy insertion in the hose and providing a tight grip under clamp pressure. Plain design and construction—no parts to foul up or get out of order.



I.P.T. Male End

I.P.T. Female End

Locking heads are identical for all sizes of hose or threaded pipe ends, making it possible to couple any two sizes of hose, or hose and pipe, of "Air King" dimensions, without adapters, bushings or other extra fittings. Hose ends, $\frac{3}{8}$ ", $\frac{1}{2}$ ", $\frac{5}{8}$ ", $\frac{3}{4}$ " and 1". Pipe ends, $\frac{1}{4}$ ", $\frac{3}{8}$ ", $\frac{1}{2}$ ", $\frac{3}{4}$ " and 1".

PATENTED LOCKING ARRANGEMENT

A cotter pin, nail or wire inserted through holes in flanges on locking heads, after connection is made, will prevent the coupling from coming apart regardless of how it is handled.

Stocked by Manufacturers and Distributors
of Mechanical Rubber Goods.

IF IT'S A **DIXON** PRODUCT

IT'S DEPENDABLE

DIXON
VALVE & COUPLING CO.
Main Office and Factory: PHILADELPHIA, PA.
BRANCHES: CHICAGO, BIRMINGHAM, LOS ANGELES, MOUNTAIN VIEW, N.C.

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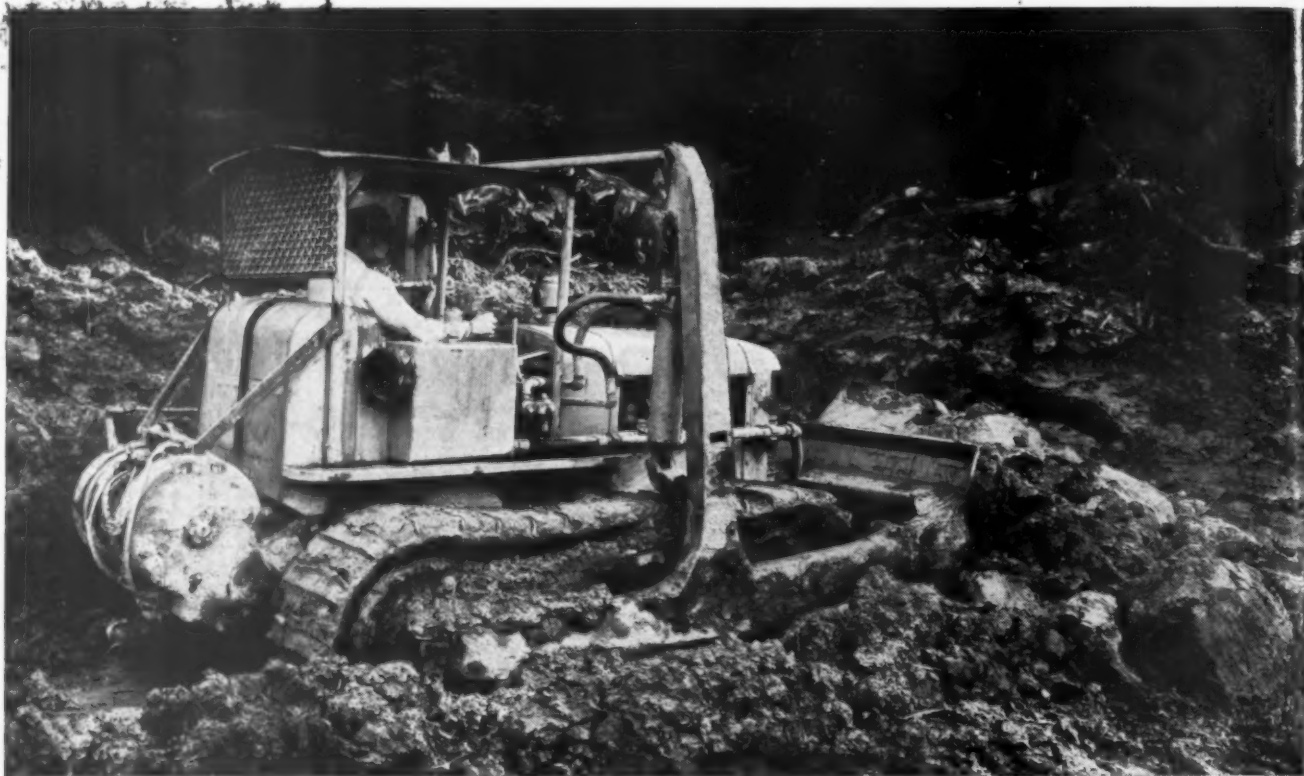
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